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Chemical Age

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Costly Coal

THE National Coal Board, whose third annual report presented to the nation last week gave no cause for celebration, firmly preserves its privilege of recording a disquieting state of affairs with a tranquillity which has been shared by none of its five million subscribers—and certainly none of its customers.

In reading the report and noting the confident and reassuring terms in which the chairman of the board, Viscount Hyndley, so ably introduced it to the Press at large it has not been possible to escape the impression that the coal authorities find their responsibilities far less harsh and exacting than do heir counterparts in the average joint stock company, many of whom seem to find no ground for complacency in the evidence alone of greatly increased production and gross profits, often with some reduction of costs. The Coal Board, revealing an infinitely less satisfactory state of affairs, seems to have no qualms.

The unpalatable facts about the country's coal industry in 1948 cannot be wholly obscured by the evidence that the dismal picture presented in 1947 of under production at almost prohibitive costs to produce at the end a deficit f £23.25 million has been fundamenally changed for the better in 1948. ne relief may be derived from the knowledge that the vast accumulation of debt has been checked, but a few company chairmen in any other sphere, reporting a surplus of £1.7 million which the NCB had at the end of 1948, could confidently adopt the view expressed by Lord Hyndley, that "they had improved their performance to the tune of £25 million." That reflects an asumption that unprofitable working is the norm, and in the whole of this report there is little evidence that the Coal Board authorities are prepared to abide by the rules governing all (unprotected) great industries either in judging what has been achieved or planning future policy.

The actual results achieved by the colliery industry are fortunately, if not wholly reassuring, no longer marked by the alarming inadequacy apparent a year before. While the failure to reach the modest target set by the Government (211 million tons) has not been forgotten, the rise in mined output of 10.4 million tons (5½ per cent) to a total of 197.6 million tons has removed the disgrace of having to depend upon American production for some of our essential needs. The measure of that improvement was the ability to export 16 million tons and make available 9 million tons more for home use.

Such improvements as these, however, have required the stimulus of a

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combination of favourable conditions which cannot be enhanced year by year to ensure that the trend is continued. There were 800 more mineworkers (237,000 fewer than the Government hoped), a much more ample equipment of coal cutting and conveying machinery and financial resources which only the artificial conditions of a sellers' market can provide. It cost in 1948 46s. to raise a ton of coal and a heavy charge upon the national funds must finally have resulted were coal prices not now inflated to an unparalleled extent. To secure a profit sufficient to cover operating costs, pay the current instalment of the colliery purchase price and retain a small balance it was necessary to charge home users on an average an additional 5s. per ton and to increase export prices sufficiently to secure around 7s. (6s. 11½d.) per ton more from all sources. Of this temporary increment, which clearly cannot be duplicated or even maintained in increasingly competitive conditions, nearly 4s. 4d. per ton was required to cover the increase in the average cost of production, of which 2s. 9d. was absorbed by enlarged wages costs.

The question which arises spontaneously in this connection seeks an assurance that the further rise which 1948 has brought in the cost of coal-getting is the last—heavy industry can stand no further enlargement of "the coal tax," and foreign users are already turning to other and cheaper sources of supply. According to Lord Hyndley, this tide has indeed turned. "The cost curve," he discloses, "was flattening out towards the end of 1948. In 1949 it has started to fall." Whether that overdue reversal has continued will not be known until the Coal Board makes its next annual report. If the board permits anything to stand in the way of producing cheaper coal, such as miners' prejudices against machine methods and employment of foreign workers, or itself indulges in excessive spending for "social" ends before much fuller production has been achieved, it will stand condemned by any standard, and doubly damned by the criterion which the Labour Chancellor of the Exchequer has set for all other industries. One of the most competent judges of the economics of coal, Sir Charles Reid, indicated earlier this year that coal users would be fortunate to see a rebate of 5s. per ton on present prices before the year 1965. (THE CHEMICAL AGE, *60*, 439). The latest report of the National Coal Board contains nothing to prove that his estimate was unduly pessimistic.

Notes and Comments

Balanced Views on Steel

THE full extent of the powers contained in the host of provisions of the Iron and Steel Bill, to which such cursory treatment was given under the "guillotine" method of limiting unwelcome debate in the House of Commons, has been revealed now in its true and disconcerting proportions. The credit for that goes to the retention of the right to adequate debate by the House of Lords, whose proceedings last week and this have ensured that no one henceforth should plead ignorance of the sweeping powers the Government is seeking—to make chemicals or tennis rackets or almost anything else—if it should in fact, realise its ambition to be the monopolists of large-scale steel production in Britain. In the course of one day's debate last week the Government leaders in the Lords were obliged to accept the principle of a series of precautionary amendments to ensure that the proposed corporation—should it come into being—shall not be a "closed shop," disregarding representatives of consumers and of the independent steel interests and industrial interests in general. It was significant that several of these safeguards, such as those relating to the protection of consumers and the limitation of steel companies and subsidiaries to their present spheres, unless Parliament sanctions their extension, were determinedly opposed by the Socialists and had to be carried to division before they were adopted. Britain's steel industry is, of course, by no means as irrevocably "in the bag" as it is pretended; but there is little doubt that the final prospect of gaining intelligent and equitable legislation for steel would be slender in the absence of the balanced revisionary powers of the Lords.

Mining and Metallurgy

SIXTEEN countries of the British Commonwealth and 11 others, including the U.S.A., will be represented at the Fourth Empire Mining and Metallurgical Congress to be held in Great Britain from July 9 to 23. It will bring together scientists and industrialists from the most remote parts of the earth, and almost every land under the British flag, to deal realistically with mining within the Empire and with the metallurgical processes by which the products can be turned to use. The history of civilisation is intimately bound up with the advance of knowledge of minerals and of metals, so that this congress may in the long run have a value which cannot be wholly expressed in terms of the results in industry. The duration of the congress, the number of members taking part, and the wide scope of its proceedings indicate that it will be on a much larger scale than its predecessors at Wembley (1924), Canada (1927), and South Africa (1930). Since then, the growth of mining and the extension of oil refining and of metallurgical processes has entirely changed the Commonwealth position. So far as metals are concerned, except for copper, the Commonwealth could be almost entirely independent in a time of crisis.

Conservation

IT is a fortunate coincidence that the locating of the congress in England corresponds with a period when mining commands more interest than ever before and the department of coal recovery is subject to more critical attention than has ever been given it. The concurrent Colonial Month and Colonial Exhibition in London should help to lend point to and illuminate some of the topics broached at the congress. From the viewpoint of visitors from relatively coalless Continental countries the spectacle of the apparent improvidence in this country presented by smoking chimney stacks will not escape notice, although from our own point of view the circumstance that nearly one-fifth of the coal used here is now made to yield its tar, benzole, ammonia, etc., affords grounds for satisfaction. In the realm of petroleum, in which nearly all the countries to be represented have projects to increase the yield of the national product or to use coal to supplement it, the British and American contributions should be the most authoritative. Apart from these specialised considerations, however, the congress will afford opportunity for scientists, engineers and others concerned with the mining and metallurgical industries to meet and discuss technical progress and problems, among which development of the mineral resources of the Commonwealth are most deserving of attention. After sessions in London, technical meetings will be held at Oxford, Edinburgh and Newcastle-upon-Tyne. The outcome of these should be of more than academic interest and whatever findings are reached cannot be dissociated from the current readiness in the U.S.A. to collaborate fully in opening up new territories and the forthcoming conference on world resources under the auspices of Unesco.

The Open Door

THE importance of informal personal contacts between research workers was emphasised at the official opening in London last week of the Ciba foundation for the promotion of international co-operation in medical and chemical research. Sir Henry Dale, who declared the building open, referred to science as being at present "the poor helpless conscript" of destruction, and appealed to the foundation "to keep open a door for the eventual return to sanity," and in the meantime to invite those countries behind the "iron curtain," whenever opportunity occurred. He pointed out that where international congresses of large numbers tended to stifle full, uninhibited discussion of new knowledge, the dignity and restful atmosphere of this elegant building could not fail to encourage confidence in the scientists fortunate enough to be among the experts invited. Lord Beveridge, a member of the trustees (the others being Lord Horder, chairman, Prof. E. D. Adrian and Mr. Raymond Needham, K.C., who has been the inspiring genius, as well as the legal adviser), said that the foundation, lacking laboratories of its own, might yet prove "a successful laboratory for mixing scientists." It is appropriate that this new centre of research should owe its conception to Switzerland which through two world wars has remained a beneficent source of international goodwill through the Red Cross. It is good to feel the visiting experts will carry away with them pleasant recollections of all that is best in English architecture and comfort inspired by the quiet charm of this house in Portland Place.

Personal Productivity

MR. A. P. YOUNG, chairman of the Institution of Works Managers, in his report on industrial productivity in the U.S.A., gives an interesting account of those factors in American industry which he considers should be better known in this country, and of techniques employed there which might with advantage be applied in British manufacturing establishments. He bases his views on what he saw on a five weeks' visit to the U.S.A. Mr. Young does not discredit the widely accepted view that the key to greater productivity is more horse power per worker. In America, he writes, the power driven has been more effectively harnessed, so that there is seven horse power at the command of every worker in the manufacturing industries compared with three in Britain. Against this, the "bouquet" handed to the British worker is a reassuring confirmation of our ability to deliver the goods, when given the technical and other equipment required. Mr. Young quotes a leading representative of the U.S. Bureau of Labour Statistics as saying: "When you compare the personal productivity in the two countries there is nothing in it. If anything, the Britisher may be working a little harder." There is much loose talk about this supreme question of relative productivity says Mr. Young, and much of it has been unfair to the British worker who, despite the discouragement offered by an atmosphere of austerity which has prevailed for nearly ten years, is doing a magnificent job of work.

SOLVENTS PRICE REDUCTIONS

Acetic Acid and Anhydride

REDUCTIONS of prices of acetic acid and acetic anhydride, following the reduction in price of ethyl alcohol (THE CHEMICAL AGE, *60*, 833), are announced this week by British Industrial Solvents, Ltd. The new prices are effective from June 1.

Certain alterations have been made in the tonnage categories scheduled, but the reductions amount to some £7-£8 per ton for glacial acid and £3 per ton for acetic anhydride. With the cessation of Government control, it is again possible to make contracts for the supply of these materials, states the B.I.S. announcement.

Government Stocks

There still remain substantial Government stocks of all grades of acetic acid which B.I.S. and other suppliers have undertaken to liquidate. Until these are cleared it may be necessary to supply acid in such containers as are now in use.

Price schedules for BISOL acetic acid for dispatches on and after June 1 for 10-ton lots (or contract) range from £73 per ton for glacial 99/100 per cent BP to £60 per ton for 80 per cent technical.

Deliveries in carboys involve an addition of £7 per ton, and in demijohns £11 per ton. Glacial acid cannot be supplied in carboys.

BISOL acetic anhydride price for dispatches on and after June 1 for 10-ton lots (or contract) is quoted as £100 per ton, for 1-ton spot £101 per ton, or 1 x 90 gal. drums £102 per ton.

There are the usual additional charges for delivery in carboys or demijohns and an abatement of £2 per ton for 2500-gal. loads.

A New Look

THIS number of THE CHEMICAL AGE, the 1564th and the first of the 61st volume, differs in two respects from all its predecessors. The chief departure from what has been rendered familiar by many years' usage is the introduction of new type faces in some of the headings and, more conspicuously, in the text, which has gained in boldness and " readability." The other minor change relates to the cost of single copies and is enforced by the continued high level of costs of production, especially of paper, and of distribution. Single copies now cost ninepence or, post paid, one shilling. The annual subscription (30s.) is unaltered.

MORE STANDARDISATION ?

Official Investigation Set Up

THE increasing usefulness of standardisation and the growing volume of work likely to fall on the British Standards Institution have been recognised by the appointment by the Government of a committee to consider the constitution, finance and organisation of the institution.

The members of the committee, which is to begin work at once under the chairmanship of Mr. Geoffrey Cunliffe (British Aluminium Co., Ltd.) are: Sir William Palmer (British Rayon Federation); Mr. A. V. Nicholls (Automotive Engineering Co., Ltd.); Mr. Roger Duncalfe (British Glues & Chemicals, Ltd.); Mr. E. P. Harries (Trades Union Congress); Mr. O. W. Humphreys (General Electric Co., Ltd.); and Sir Ernest Leman (chairman of the Ministry of Supply Committee on Engineering Standardisation).

Mr. Harold Wilson, President of the Board of Trade, who announced the formation and terms of reference of the committee, said that the Government was convinced that standardisation should be encouraged, and that industry, working with the British Standards Institution, should do the work. It was hoped that the committee would report by the end of the year.

BMA Exhibition

AMONG the diversity of drugs and pharmaceuticals on view at the British Medical Association Exhibition which concluded at Harrogate yesterday, Glaxo Laboratories, Ltd., were showing heptalgin and penicillin products.

Streptomycin, supplies of which are allocated in Britain by the health authorities, was also presented by Glaxo, which this year supplied 220 hospitals in England and Wales, compared with 30 at the time of last year's exhibition. Large-scale production will begin at Ulverston in the next few months.

A great advance in liver extract preparation is represented by its accurate standardisation as a result of the achievements of Shorb—who developed a microbiological method of assay—and of Rickes, Brink, and others in the U.S.A., and Dr. Lester Smith, senior biochemist of Glaxo Laboratories, in isolating the anti-anaemic factor as a pure crystalline substance.

Fuller German Production of Key Chemicals

The Search for Export Markets

ALTHOUGH the official index of German industrial production for May indicated an advance by 5 to 87 points (1936 = 100), chemical manufacturers in Western Germany do not all report a further increase in output. The production of soda in particular has begun to decline, a fact said to be due to smaller calls from domestic consumers, and the output of washing agents has also fallen sharply since the beginning of the year.

Compared with the corresponding period of 1948, however, most important chemicals, including sulphuric acid, calcium carbide, nitrogenous fertilisers, soap and dyestuffs, show an output increase of about 50 per cent. The production of caustic soda and phosphate fertilisers has risen about 60 and 80 per cent respectively and the rayon output has more than doubled.

To Belgium and Italy

As the domestic market seems to be approaching saturation point, more attention is being paid to exports. In the trade agreement with Belgium which covers the 12 months ending June, 1950, Western Germany has undertaken to supply the equivalent of £105 million worth of chemicals, which will thus account for one-tenth of all West German exports to Belgium, excluding coal. Italy is to receive the equivalent of £1.25 million worth of chemicals from Western Germany.

The potash industry especially reposes great hopes on an expansion of exports, more particularly to Belgium and to the United Kingdom. Production in the Anglo-U.S. zone during January-May this year amounted to 245,500 metric tons of K_2O, equal to an annual output of 590,000 tons, which compares with a production of 485,000 tons in 1948 and a pre-war consumption in the area of the Anglo-U.S. zone of 529,000 tons.

While limited quantities are being sent to the French occupation zone, where the local output of 70,000 tons of K_2O annually is not sufficient to meet the requirements of agriculture, appreciable quantities can now again be exported, and the works in the British zone have recently resumed foreign shipment of potash salts. The works in the U.S. zone resumed exports earlier this year.

After resumption of operations in the Hugo pit of the Bergmannssegen works at Lehrte, Lower Saxony, efforts are now being made to reopen more potash works. Preparations to this end have been made at the Koenigshall-Hindenburg and Riedel works.

Estimates of fertiliser production in the year ending June, 1950, indicate that substantial increases are expected for all major products. An output of 400,000 tons of N, 460,000-475,000 tons of P_2O_5 and 615,000 tons of K_2O is anticipated, compared with a monthly output in April last of 27,400, 21,000 and 50,900 tons respectively. If these estimates are met, there will still be a shortage of basic slag and cyanamide and difficulties may be encountered in respect of all nitrogenous fertilisers. Manufacturers of potash, phosphate and compound fertilisers, however, believe that they will be able to meet all demands.

The quick pace of reconstruction in the rayon industry is shown by the increase of production at the Rheinische Zellwolle A.G., Siegburg, from 30 tons daily in January to 55 tons in June. The price of rayon has meanwhile been lowered from Dm. 3.60 to Dm. 2.95-3.20 per kg.

Operations have begun in a shale oil refinery erected by Lias Oelschiefer Forschungs-G.m.b.H. at Frommern, South Wuerttemberg, in the French zone of Germany. The plant capacity is 10,000 tons a year, and the refinery will thus be able to deal with the whole of the crude shale oil obtained at the distillation plant. This has been in operation at Frommern since May, 1947, producing a crude oil with a high sulphur content which can be used only by certain types of engines.

TRADE WITH SWEDEN

CHEMICALS and minerals, to the value of about £1 million, were included in the goods for which the Swedish authorities indicated they were prepared to grant additional import licences, at the recent trade talks in Stockholm between Britain and Sweden.

The delegations reviewed the working out of the trade and payments arrangements for 1949 reached during talks in London at the end of last year.

It was estimated that despite certain reductions in the value of Swedish exports to the U.K., the Swedish authorities would be able to afford additional imports from this country to about £6 million above the originally anticipated figure.

Machinery and vehicles and textiles were among the products covered by this sum.

CHEMICAL EXPORTS AGAIN INCREASE

Value of May Totals Exceeds £8 Million

FOR the first time since January this year, chemical exports from the United Kingdom in May reached a total of more than £8 million.

Totals given in the latest issue of *The Trade and Navigation Accounts* of the U.K. were £8,091,749 compared with £6,983,784 in May, 1948, and £5,115,005 in the corresponding month of 1947.

Some notable individual increases compared with May, 1948, were those of ammonium sulphate, 32,386 tons against 12,756 tons; methyl alcohol, 12,756 gal. from 6546 gal.; formic acid, 5641 cwt. from 1844 cwt.; and sodium sulphate, 46,698 cwt. compared with 14,153 cwt.

Exports of chemicals, drugs, dyes and colours for the first five months of 1949 reached a total of £37,603,367 which showed an increase of £4,654,682 over the same period of 1948 and £12,182,954 over 1947.

CHEMICAL EXPORTS

	May 1949	May, 1948
	Cwt.	Cwt.
Formic acid	5,641	1,844
	Lb.	Lb.
Salicylic acid and salicylates	173,534	143,665
Value of all other sorts of acid	£108,587	£76,697
	Tons	Tons
Aluminium oxide	1,111	1,052
Sulphate of alumina	2,369	1,678
All other sorts of aluminium compounds	391	311
Ammonium sulphate	32,386	12,756
Ammonium nitrate	10,644	6,146
All other sorts of ammonium compounds	1,680	1,758
	Cwt.	Cwt.
Bleaching powder	33,022	19,828
All other bleaching materials	7,732	6,698
	Gal.	Gal.
Cresylic acid	60,627	263,764
Tar oil, creosote oil, anthracene oil, etc.	4,077,401	4,597,170
Value of all other sorts of tar oil	£19,006	£46,613
	Cwt.	Cwt.
Collodion cotton	4,258	3,405
	Tons	Tons
Copper sulphate	4,643	1,872
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	42,200	68,040
	Tons	Tons
Fertilisers	832	6,295
	Cwt.	Cwt.
Nickel salts	6,214	2,515
	Tons	Tons
Lead acetate, litharge, red lead, etc.	4,336	13,413
	Gal.	Gal.
Tetra-ethyl lead	90,841	123,513
	Tons	Tons
Magnesium compounds	873	1,139
	Gal.	Gal.
Methyl alcohol	12,756	6,546
	Cwt.	Cwt.
Potassium compounds	5,227	7,567
	Tons	Tons
Salt	23,479	18,651
	Cwt.	Cwt.
Sodium carbonate	299,649	328,509
Caustic soda	254,561	207,875
Sodium silicate	20,465	14,680
Sodium sulphate	46,698	14,153
All other sodium compounds	80,739	85,964
Cream of tartar	758	231
Tin oxide	467	440
	Tons	Tons
Zinc oxide	950	1,156
Total value of chemical manufactures, excluding drugs and dyestuffs	£4,504,460	£3,872,561
	Oz.	Oz.
Quinine and quinine salts	156,693	82,391
	Lb.	Lb.
Acetyl-salicylic acid	116,877	129,882
	100 International units	100 International units
Insulin	951,170	828,555
	Mega units	Mega units
Penicillin	577,961	349,252
Total value of drugs, medicines, and preparations	£1,790,990	£1,268,375
Total value of dyes and dyestuffs	£757,876	£654,816
	Cwt.	Cwt.
Plastic materials	32,099	29,269
Value	£427,989	£390,769
	Cwt.	Cwt.
Chemical glassware	1,483	1,670
Value	£53,415	£53,649
	Cwt.	Tons
Fans	3,369	232
Value	£100,074	£131,748
...	Cwt.	Tons
Furnace plant	6,546	405
Value	£75,713	£74,574
	Cwt.	Tons
Gas and chemical machinery	16,817	702
Value	£185,491	£144,426

CHEMICAL IMPORTS

	May, 1949	May, 1948
	cwt.	Cwt.
Acetic acid	11,740	28,553
Boric acid	7,680	7,460
All other sorts	1,036	4,603
Borax	36,300	7,040
Calcium carbide	—	3,044
Coal tar products (excluding benzol and cresyllic acid)	—	8,485
Cobalt oxides	539	1,277
	Tons	Tons
Arsenic	272	800
Fertilisers	2,425	413
	Lb.	Lb.
Iodine	66,056	66,050
	Cwt.	Cwt.
Potassium chloride	999,854	1,001,926
Potassium sulphate	13,340	18,880
All other potassium compounds	3,914	1,220
Sodium nitrate	99,700	—
All other sodium compounds	5,693	2,869
Carbon blacks (from natural gas)	38,788	48,678
Total value of chemicals, drugs, dyes and colours	£2,435,606	£2,643,381

Chemical Derivatives of Coal Gases

Practical Results of Belgian Research

WHILE most of the papers at the International Gas Conference in London last week were devoted to aspects of gas engineering, some were of particular interest to chemists.

In his contribution on " Some Aspects of the Chemical Valorisation of Coal Gases in Belgium," Dr. Paul Ferrero opened by reviewing briefly work on the isolation and use of the hydrogen of coke oven gas. While it was natural to think first of this component—which constituted 55-60 per cent of the coke oven gas—the next stage was to consider the hydrocarbons, representing 25-30 per cent.

Ethylene Isolation

At a later stage still, interest was aroused in the olefin content. Although this represented only 2 per cent available from the original coke oven gas, one of the fractions obtained in simple fractionation of the latter contained 20-25 per cent olefins. This fraction could then be rectified under pressure permitting the isolation of ethylene at any desired degree of purity.

The most promising of the derivatives of ethylene from this source—taking into account quantities, cost and purity—were those based on ethylene oxide, for the preparation of which the following process had been successfully used in Belgium since 1936.

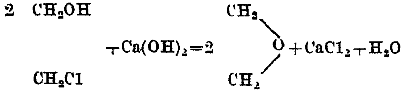
Starting directly from ethylene, water and chlorine without a catalyst, secondary reactions forming dichlorethane were reduced to a minimum.

The ethylene was finely dispersed in the reaction column in a solution of hypochlorous acid, the concentration of the latter being maintained by the addition of chlorine to the solution. Then

$$Cl_2 + H_2O \rightarrow HOCl + HCl$$

and $HOCl + C_2H_4 \rightarrow CH_2Cl.\ CH_2OH$

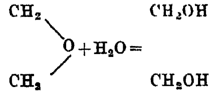
with yields of 89 per cent of chlorhydrin. Reaction of the resultant solution with milk of lime yielded ethylene oxide according to the equation



$$2 \begin{matrix} CH_2OH \\ | \\ CH_2Cl \end{matrix} + Ca(OH)_2 = 2 \begin{matrix} CH_2 \\ | \\ CH_2 \end{matrix}\!\!>O + CaCl_2 + H_2O$$

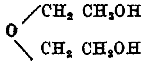
This mixture was heated to 90° C. by live steam and the ethylene oxide distilled off.

Most important of the derivatives were considered to be the glycols. Addition of one molecule of water yielded ethylene glycol.



$$\begin{matrix} CH_2 \\ | \\ CH_2 \end{matrix}\!\!>O + H_2O = \begin{matrix} CH_2OH \\ | \\ CH_2OH \end{matrix}$$

but in practice it was difficult to avoid the formation of di- and tri-glycols, via the stage



$$O<\begin{matrix} CH_2\ CH_2OH \\ CH_2\ CH_2OH \end{matrix}$$

If the ethylene oxide was reacted with alcohol instead of water, the mono-alkylglycols were obtained; if with fatty acids, surface active agents. With hydrogen sulphide thiodiglycol was produced. Reaction with ammonia yielded the ethanolamines.

It was also possible to prepare ethylbenzene by condensation with benzene; this might then be dehydrogenated to styrene and this, in turn, reacted and polymerised to styrol resins.

Dr. Hs. Deringer, director of the gas undertaking of Winterthour, described a new scheme for the absorption and recovery of carbon monoxide in town gas.

Detoxification

The doctor's researches had been built round the observation that certain salts added as crystals to a neutral solution of cuprous chloride aided absorption of carbon monoxide. These crystals reacted with the complexes $CuCl—CO—H_2O$ which were initially formed and yielded new solid phases of which the sorption pressure was lower for a given charge of carbon monoxide. The kinetics of these reactions had been studied and, from them, the volume necessary for washing out the CO had been calculated. For a detoxification project for 1000 m^3 of gas per hour at Winterthour, a two-stage absorption installation was being erected with a gas capacity of the washers of 50 m^3, that is to say a total capacity of 75 m^3.

The complexes produced were decomposed in two stages under vacuum, thus permitting the CO to be recovered.

Oxidation of the absorbent was not serious, despite the fact that town gas contained several per cent of oxygen,

(continued at foot of page 10)

THE "HOT" LABORATORY AT HARWELL

Elaborate Safeguards in Separating Fission Products

ONE wing of the new radiochemical laboratory at the Atomic Energy Research Establishment at Harwell, Berkshire, is now ready, and scientists are to begin work there almost immediately.

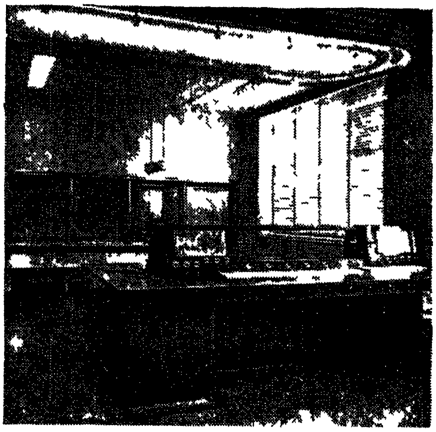
This was announced last week by the Ministry of Supply, which states that the building is the most complicated project of ts kind undertaken on this side of the Atlantic.

Scientists will be tackling one of the most difficult problems in the atomic energy programme—that of research on the chemical separation of the fissile element plutonium from uranium rods in a pile. The rods contain very radioactive "fission products" and it is this chemical separation that presents the greatest difficulties.

The laboratory will also be used for other chemical work with radioactive materials, including the separation of radioisotopes produced in BEPO (British Experimental Pile), and processing materials that have been irradiated in the pile.

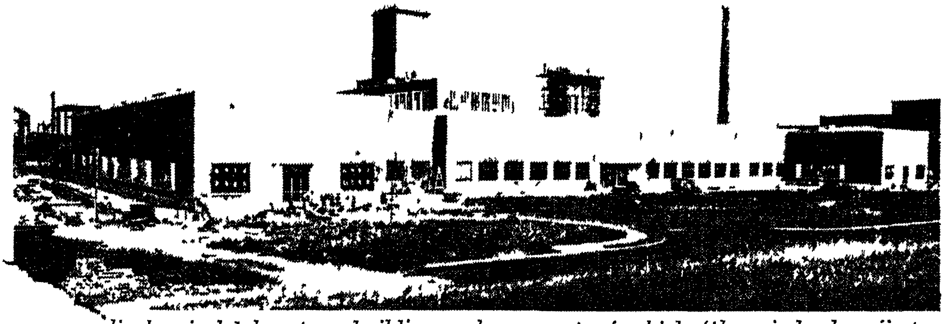
The type of work to be carried on in the laboratory involves new problems—particularly regarding the health and safety of the worker and the control of any active material in dust, gases or effluent.

The building is designed to provide every facility for working with "hot" (radioactive) materials. In the centre of the ground floor is the administrative block, which consists of offices, laboratories, stores, and workshops.



The keynote of this typical laboratory is provided by the precautionary devices, special air inlets and air ionisation chamber above the work bench, lead lined cupboards and a monitor above the fume cupboards

Connected with it by air locks are two wings. These house the "hot" laboratories. In the first floor, which is windowless, and the tower is a complex system that carries the main services and air ducts to a special ventilating plant. The operation of these is supervised in a central control room, and there is a reserve equipment to deal with any failure.



iochemical laboratory building, a large part of which (the windowless first given over to complex services and ventilation, for which the square central tower serves as the exhaust

A hospital finish is used throughout the building and corners are rounded. Changing rooms and showers are provided for staff entering or leaving "hot" areas, and foot-operated wash basins, with air-driers, are situated outside each laboratory group. Doors in "hot" area corridors are automatically operated by photo-electric cells to reduce still further the risk of contamination from the hands. Equipment for "monitoring" hands, clothing and body—that is to say, checking for radioactivity—is provided at washing places and an automatic monitoring system "checks" people leaving the building.

Active dust and fumes from the chemical processes are a possible airborne danger to health; the extraction system deals with this problem, while strict cleanliness minimises the dust. Dust-free air is admitted, and its flow, at the maximum rate of some 360,000 cu. ft. per min. is distributed so as to extract any active dust and fumes.

CHEMICAL DERIVATIVES OF COAL GASES

(*continued from page* 8)

because the rate of oxidation was about $\frac{1}{200}$ that of the rate of absorption of CO. The small portion that became oxidised was readily reduced by treatment with metallic copper in accordance with well-known practice.

Beause of the respective positions of copper and of iron in the electrometric series of elements ($Cu \rightarrow Cu^{\cdot\cdot} + 0.345$ v.; $Fe \rightarrow Fe^{\cdot\cdot} + 0.440$ v.), contact of the absorbent with metals less noble than copper was avoided.

Fresh Ground

These studies covered entirely fresh ground, since previous work on cuprous chloride as absorbent had been on ammoniacal cuprous chloride and the cupramines used in the synthesis of ammonia.

The national reports on researches in various countries included references to chemical projects.

That on research in the British gas industry by Dr. J. G. King included reference to synthesis of methane. A major programme was devoted to study of a one-stage process of gasification of bituminous coal in steam and oxygen bringing about synthesis of methane.

One research team was devoted to fundamental work on gas separation by refrigeration. A new process for removal

This maximum rate of flow is equivalent to 120 complete air changes per minute in a laboratory. Under normal conditions, however, the rate will not exceed 40 changes per minute.

Any active solids removed in this way are retained by precipitators so that the exhaust air leaving the central square tower is harmless. Similarly, all effluent through the drainage systems is segregated and monitored before final disposal.

Work with active materials will usually be carried out in ventilated fume cupboards where remote control of processe from behind walls of interlocking leac bricks may be used. Separate concrete surrounded rooms are provided for work with highly radioactive materials.

All laboratories are continuously monitored so that the staff may know the amount of radiation to which they are exposed. Fire alarm and alarms for radioactivity risks are provided throughout, and the location of an alarm signal is recorded centrally.

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of organic sulphur compounds from coal gas employed molybdenum sulphide as a hydrolysis catalyst in the presence of hydrogen sulphide and water vapour. The work also included researches on effluent treatment to remove harmful components.

Water Gas

Researches in the U.S.A. reported by the American Gas Association had led to working plants for catalytic re-forming of hydrocarbon vapours with steam. In this work, concentration had been centred on the production of water gas which avoided the formation of tar products and condensibles. Its report, not yet elaborated, was that the industry might one day emerge as a basic chemical industry with heat supply as a by-product.

The organisation of the Gas Research Centre of France, reported by Prof. G. Ribaud, director of studies at the Centre, included divisions devoted to chemical researches and coal tar derivatives. The latter had departments investigating benzols, phenols, paints and rubber, and agricultural products.

Pipe Protection

A corrosion service for the protection of gas installations had existed since th beginning of the research organis
Much of its work had, of cour
electrochemical, being concerned
protection of pipes from parasi
currents by the use of cathodi
and of magnesium as a sacrifi

MOBILE LABORATORY UNITS

Making Full Use of Available Equipment

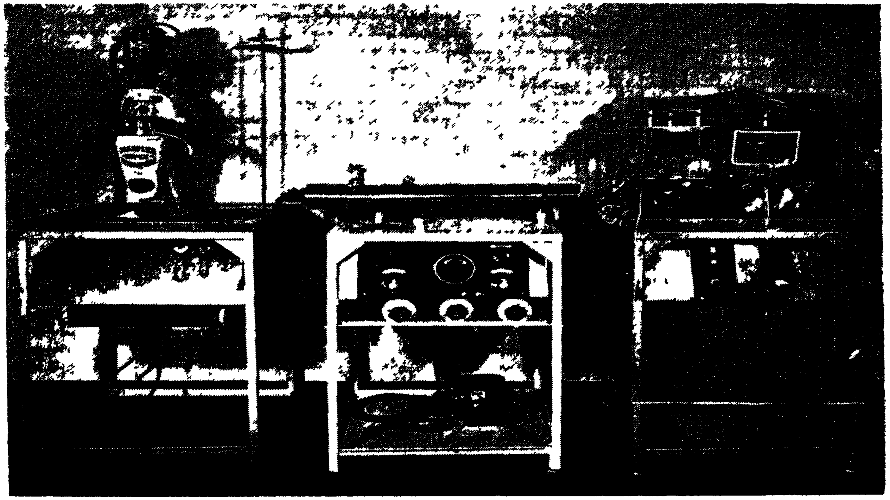
A RECURRING problem in a laboratory engaged on routine testing is the maintenance of permanent equipment in such a way that it is always available for immediate use, although it may not be needed for days on end. Valuable bench space is often tied up, or else the apparatus is dismantled and stored away after use, so that it takes a considerable time to locate component parts and more time is wasted in re-erection and adjustment.

Esso European Laboratories claim to have solved this problem in such a way that not only are the original troubles relieved but the availability of the apparatus which has to be shared by groups of workers is increased.

A trolley of uniform size was developed. The units comprising it consist essentially of a two-foot square flush metal top standing 3 ft. from the ground. This is supported by four angle legs mounted on castor wheels. A lower tray is fitted just above the level of the castors. Upon one of these trolleys the whole of any desired unit of apparatus is then mounted. The aim is not only to include the basic apparatus but also to provide storage for glassware and test specimens as well as complete tool racks where necessary.

The general principle was well applied by the method of adapting a BSI sludge apparatus to this unit construction. In this, the top platform supports an electrically heated oil bath fitted with stirrers, cooling water connection and drain manifolds.

Behind the bath a perspex panel supports the flowmeters. The capillary tubes are at right angles to the flowmeter U-tubes, thus being directed towards the pressure compensating tubes fastened to the sheet metal back plate. Above the



Three typical assemblies on trolleys, of which the one on the right, not for immediate use, is protected by a plastic hood flowmeters are the air supply needle valves for each sludging unit.

In the front face of the trolley the electrical control panel is fitted, with the stirrer motor immediately behind it on a sub-staging. The normal air cleaning train is fitted on the lower tray of the trolley, being supplied *via* the main air supply pressure compensating tube fitted against one of the rear support legs of the trolley.

Storage for six complete sets of glassware for use in this test is provided in a compartment closed by a door on the right of the apparatus.

The following apparatus and equipment have already been successfully adapted to trolley units: Air Ministry oxidation test, Sunbury beaker corrosion test; BSI sludge, Ramsbottom coke, Navy heater test, and a Sharples laboratory centrifuge.

The great advantage of this method is that it is now possible to have any of this apparatus operating in any part of a laboratory at a few minutes' notice. When not in use the trolleys are kept in a store room under a plastic dust hood (as shown). This keeps the apparatus in a clean working condition even if stored for several weeks.

The idea is proving very successful and is likely to be developed further at Esso European Laboratories.

Automatic Alarm Lessens Explosion Risks

Continuous Gas Analysis Method in the U.S.A.

A FULLY automatic method of lessening combustion and explosion risks in plants where easily ignitable gases may be released has been reported in the U.S.A. It has passed the exacting tests of the Underwriters' Laboratories, Inc., an independent standards organisation, and is the first mechanical gas detector to do so.

The Lor-Ann Combustible Gas Detector, made by a firm in New Jersey, continually samples and analyses plant atmosphere where combustible gas accumulations constantly represent a hidden fire or explosive hazard. When gas accumulation approaches a dangerous volume, an automatic alarm, both audible (bell and/or siren) and visible (neon signal light) is given and at the same time the instrument automatically takes over control of the plant's operating machinery and either the fire-fighting or ventilation system or both, depending upon the particular protection requirements.

Complete Unit

The controller of the gas detector is contained in an air-tight and dust-proof cabinet mounted on a self-supporting steel panel, which also houses a heavy duty, rotary vane, suction pump from which tubing leads to the gas analysis cells or "remote heads" which are placed at danger points. The remote heads are designed to be placed at any distance from the main control panel, the analysis taking place in the gaseous area, the result being instantaneously "telegraphed" to the control panel.

The alarm point setting is variable and can be set from 20 to 100 per cent of the lower explosive limit for any given gas. A wide-faced meter gives a constant reading of gas concentrations. In addition to the automatic gas warning signals, the detector is fitted with a separate fool-proof signalling system to indicate both visibly and audibly any failure of the instrument to operate.

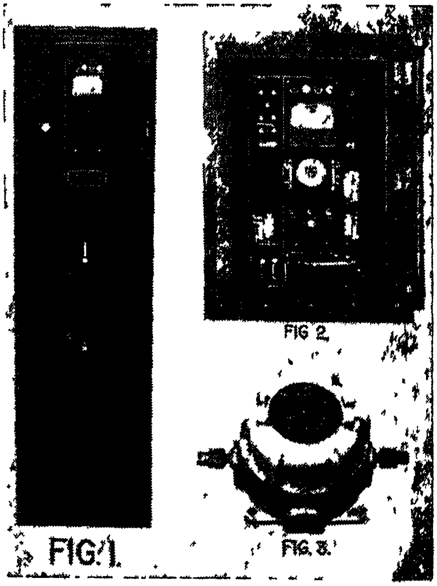


Fig. 1 shows the whole assembly: Fig. 2 is the interior of the control mechanism and Fig. 3 the sampling and analysing head

STRONG IMPERVIOUS CRUCIBLES

U.S. Claims for Better Structure and Lining

CLAY crucibles possessing properties that make them particularly suitable for smelting high-lead glazes and enamels, materials that are especially corrosive to ordinary clay crucibles, have resulted from two recent developments at the U.S. National Bureau of Standards.

One of these, a new composition for the body of the crucible, gives an improved structure. The other, an additional step in the procedure for lining crucibles, aids in sealing invisible cracks in the lining.

Resistant to Molten Fluids

The usual clay crucible is quite porous and therefore subject to penetration and attack by highly corrosive melts. By contrast, the pores in the new crucible are very small and the interconnecting passages between them so minute that they effectively resist the flow of molten fluids.

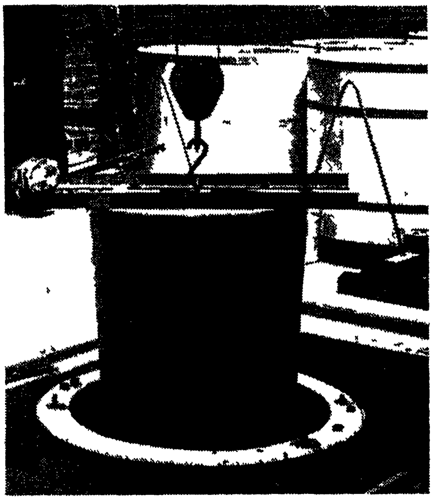
The manufacture of high-quality glass calls for pots or crucibles that will resist attack from the molten glass and that will not introduce impurities through interaction with the glass. To meet the exacting requirements peculiar to the production of optical glass, the refractories laboratory at the Bureau has for over 20 years been engaged in research on refractory clay pots, techniques for their manufacture, and special compositions for particular applications.

All the pots used by the bureau's optical glass plant have been manufactured by the refractories laboratory. Observations of the performance of pots in the plant have afforded an exceptional opportunity for the study and correction of defects in pot structure, and have led to improvements in the quality of the glass.

Slip Casting Method

For most glasses produced, two types of pots have generally been satisfactory. One, containing a dense low-porosity lining, has been used for manufacture of the more corrosive glasses, the other without a lining for those less corrosive.

Several individual procedures developed at the bureau are followed in the manufacture of these pots. The technique of slip casting, first reported nearly 30 years ago, is used exclusively in preference to hand moulding methods. In this method, the clay casting slip—the mixture of dry ingredients with the proper amount of deflocculants and water to give good flow characteristics—is poured into plaster-of-paris moulds, consisting of two parts, a shell and a core that is locked in position before the pot is cast. During the initial stage of casting, the mould is slightly tilted to lessen the tendency to entrap air bubbles between the lining and the pot. After the bottom is filled, the mould is levelled and rocked lightly until the pot is completely cast. Rocking serves the dual purpose of levelling the slip as it is cast and of freeing the air trapped in the slip during the casting operation.



After the core has been lightly scraped to remove surplus slip, it is lowered into the shell of the mould, where the crucible is cast round the lining

Lining of the pots is in effect applied before the pots are cast. In other words, the lining slip is first poured around the core of the mould, which is removed and transferred to the shell. The pot is then cast in the same manner as for unlined pots. Double and triple layers of lining, up to a total thickness of ¼ in. or more, are sometimes applied.

The additional step that has recently been introduced for lining crucibles consists in spraying a coat or coats of clay slip over the lining to seal incipient cracks. Such faults often open during

(*Continued at foot of following page*)

Improved Metal Comparators

The new test head comparator in use

WIDER application and utility has been conferred on the G-E metals comparator by a new test head developed by the (U.S.) General Electric Company's special products division. For use on flat surfaces, particularly of large equipment, the new test head was designed for those instances in which the conventional test unit, the test coil, is inapplicable.

By comparing ferrous or non-ferrous metal parts with a known standard, the metals comparator provides a quick, non destructive test of the quality of the parts.

The equipment consists of an electronic unit mounted in a steel cabinet and a test unit; either a coil for small metal parts or the new test head. The electronic unit includes a balancing network, oscillator, and indicator. The new test head has a contact surface consisting of a ring separated from a concentric core by an air gap, whereby a radial magnetic path is formed across which the test piece is placed. Three inches long, it is produced in various face diameters.

The device is basically an impedence comparator. The impedence of a test unit will vary with the electrical and magnetic properties of the specimen being tested. Through the use of standard or reference specimens changes in the chemical and physical properties are correlated with the electrical and magnetic properties.

STRONG IMPERVIOUS CRUCIBLES

(Continued from previous page)

use and permit a fluid glass or glaze to penetrate into the walls or, in some instances, to leak through the crucible.

The cores are removed as soon as practicable after casting in order to prevent cracking of the lining—timing of this operation is critical—and the shells are removed when the pots have set sufficiently to retain their shape. The pots are then air-dried and, finally, immediately before use, are heated to approximately the temperature of the melt they are to contain. A carefully regulated heating schedule has to be followed and the rise in temperature controlled in accordance with the relative speed with which the pot can be heated through certain ranges without damage.

Corrosion Resistance

The new crucible composition orginally developed for highly corrosive glasses, possesses several desirable properties in addition to its unusual pore structure. It has low gas permeability, even though it shows a porosity of 22 per cent after firing at 1435°C. Crucibles of this composition have somewhat lower resistance to thermal shock, but considerably greater resistance to corrosion.

Crucibles are finished by cutting surplus material from the rim (foreground); stirring thimbles (centre background) are cast of the same material as the crucibles and coated with lining slip

INDUSTRIAL USES OF ITACONIC ACID

Its Application in the Manufacture of Alkyd Resins

BY A SPECIAL CORRESPONDENT

ITACONIC acid has long been known to students of organic chemistry as one of the three isomeric acids obtained by heating citric acid, the others being aconitic acid and itaconic anhydride.

It is only within the last few years that itaconic acid has assumed importance as an industrial chemical, and with the development of new and economical methods of manufacture, some of which are based on vegetative fermentation, there is a growing interest in its potentialities for the production of alkyd resins and unsaturated polyesters.

This unsaturated dibasic acid is odourless, non-toxic, and available as a white crystalline non-hygroscopic powder. It has a relatively low solubility in cold water but dissolves more readily as the temperature of the water increases; thus at 20° C. the solubility is 8.3 gm./100 ml. and at 80° C. 72.5 gm./100 ml.

Solubility in organic solvents, including the paraffin hydrocarbons, is very limited, but in the more polar types of solvents, such as the lower ketones and alcohols, the acid is moderately soluble. Like other dibasic acids, such as maleic and fumaric, itaconic acid undergoes the usual reactions forming salts, acid salts, amides and esters. It is the last named which are now assuming the most importance.

The most interesting and important application of itaconic acid is in the manufacture of alkyd resins where the replacement by this acid of some of the phthalic anhydride (10-15 per cent) results in certain improvements.

Phthalic Acid Replacement

Normally, phthalic anhydride is reacted with alcohols, such as glycerol, pentaerythritol and glycols, the resins being modified with the oxidising oils and acid for fast drying paints and enamels, or non oxidising oils and acids for baking enamels Itaconic acid cannot be used to replace the phthalic anhydride entirely, as is the case with maleic acid which produces a varnish type of coating, but it enables a better quality alkyd coating resin to be made. The principal advantages which may be claimed for this addition can be summarised as follows

(1) The reaction time is shortened and so enables a larger output per plant to be maintained.

(2) Harder finishes can be obtained by the introduction of itaconic acid into the resin than is possible with pure phthalic alkyds.

(3) The colour of the baked or air dried coating is improved.

(4) Baking time is reduced.

(5) The percentage of itaconic acid present in the alkyd can be raised without increasing the viscosity of the resin. Indeed, it is considered by some manufacturers that one disadvantage of the use of this acid is that it tends to lower the viscosity of the resin.

Itaconic acid modified alkyds are suitable for use in the preparation of alkyd coatings for spraying, dipping, brushing, roller coating and knife coating.

New Contact Resins

The linear condensation polymers made by reacting itaconic acid with glycols offer promise as new contact resins. They are very versatile and may be used by themselves or copolymerised with monomers such as vinyl acetate or styrene.

The less known esters are dimethyl, diethyl and dibutyl itaconate, but recently diallyl itaconate has been produced in commercial quantities. All these compounds are monomers which can be converted into polymers ranging from viscose, colourless liquids to crystalline solids. Both as resins or constituents of commercial resins, and as plasticisers, adhesives and coatings, the itaconates are attracting attention.

Copolymers can be formed by reacting the esters with other monomers, *e.g.*, styrene, methyl methacrylate, etc., in the presence of per-oxygenated catalysts. By reacting polymeric itaconates with mono mers, methyl methacrylate, for example, can be polymerised with a polymeric dimethyl itaconate to produce a crystal-clear transparent resin possessing low mould shrinkage, high Rockwell hardness and good resistance to abrasion.

Preliminary experiments indicate that the itaconic esters may assume importance for permanently modifying the properties of the more familiar resins, improving the colour, and increasing hardness and abrasion resistance. In the formulation of adhesives, polymeric itaconic esters are of considerable interest, and the use of dimethyl itaconate for making cements has already been patented.

PRODUCTION AND USE OF OZONE

Employment in Italian Oil, Fat, and Varnish Processing

From AN ITALIAN CORRESPONDENT

THE availability of cheap electricity in those parts of Italy where water power is abundant, has encouraged its use in a number of industries, including those connected with oils, fats, and varnishes, where it has been introduced for the production of ozone (O_3). The old method of production, based on mechanical agitation, has been superseded wherever possible by mixing the different preparation baths in an atmosphere which has been subjected to pressure or aspiration.

Ozonised air has been found to be more effective than ordinary air in these processes, because it exercises, among other things, a more powerful chemical deodorising, decolorising and purifying action, and avoids the necessity of using the chemical products which were at one time indispensable for preparing some widely used edible and industrial products, excepting those which are necessary for neutralising acidity.

Sterilising Properties

For best results with ozonised air, it is important, of course, to have an electric plant with special application to the production of ozone, also the most suitable conditions for securing the maximum action of the gas. In Italy the "Indo" electric plant for producing ozone is the most generally used in the oil, fat and varnish works, and through its use a fairly simple, rapid and economical treatment of the different raw materials can be secured, the deodorised, decolorised and purified products turned out being of better quality than those still obtained by the ordinary processes.

In most of these works the gas is utilised to the fullest advantage. The "Indo" plant also produces with the ozone nitrogen peroxide which is found to be of great assistance in bleaching, deodorising and sterilising. This is very important as many of the chemical reagents which might be used for assisting the natural oxidation of oils and fats have undesirable properties, and some are even poisonous.

Ozone (allotropic oxygen) has an oxidising power many times greater than that of ordinary oxygen, as it replaces this during a gradual decomposition process with nascent oxygen. This explains the impressive results obtained with ozone without damaging the raw materials treated, or leaving harmful traces in the new products obtained, which acquire very useful properties not often possessed by those obtained entirely by chemical means.

Ozone destroys, besides other impurities, all natural colouring matters and those due to ageing, without altering the quality and characteristics of the oils and fats themselves. The disagreeable smell of many substances, caused chiefly by decomposing organic matters, is eliminated, as ozone oxidises and sterilises such substances, arresting their decomposition and removing the cause. Also the oil is sterilised against bacteria coming from contact with the air or through other reasons.

Varied Uses

In the refining process of some raw materials a natural fluorescence and any disagreeable taste is removed, and the final products can be used for edible purposes. Ozone finds, in consequence, a very satisfactory use in the depuration and improvement of vegetable and animal oils and fats. It is also useful for illumination products, for improving paraffin wax, mineral oils, petroleum jelly, and drying oils, in the production of varnishes and lakes, and in the bleaching of coloured natural waxes, etc.

During the treatment of the oils there is a certain thickening; with lubricating oils, ozonisation increases the viscosity. Fish, recovered vegetable and animal oils, and mineral oils, are bleached and deodorised, being transformed into suitable products for soap making and other industrial purposes, such as margarine manufacture, etc. Fish oils and fats become decolorised and deodorised even after a few hours' treatment.

Soaps

Shale oils are transformed into saponifiable oils and fats; bone grease is completely deodorised and bleached. Ozone depurates and improves colza oils which are intended for illumination. Blue resin oils lose their fluorescence. The disagreeable smell due to toluene is reduced, and with a stream of ozonised air it is possible to activate energetically the production of certain soaps.

With ozone, edible oils have been found to acquire greater softness, a better taste and, through sterilisation, a greater degree of preservation. Low quality olive oils are improved to a marked extent, as it is possible, with ozone, to eliminate the disagreeable earthy and rancid taste. Other low quality edible oils can be completely decolorised, and the products obtained may be used for producing soaps of superior quality and for various other industrial purposes.

Black and dark oleins become light, or assume a reddish yellow or orange colour, according to their type or the mixture of oils they contain. The density of decolorised products is increased and they saponify better. Oils for soap-making with any acidity can be advantageously treated. The bleached oils do not require any other treatment, and any residues in them are also decolorised. All the oils treated are transparent and have the appearance of having been filtered. They can be coloured to any shade that may be necessary.

With linseed oil, the drying process usually adopted is in reality one of oxidation. The great industrial importance of ozone in this process, therefore, is apparent.

Very good results are obtained in the purification of oils and solid fats by warming them electrically or with steam while they are traversed by a stream of ozonised air, using the apparatus for the oxidation of linseed oils which are to be made into varnishes. Here the yield can be easily increased by introducing ozonised air in the place of ordinary air. In this case ozone not only deodorises and decolorises, but also transforms certain oils rapidly into clear varnishes of superior quality.

The treatment is of great utility in the production of linoleum and related products The fat lakes of colophony can be quickly hardened and rendered clear through ozonised air. The ozone, besides accelerating the clearing of the fat lakes, brings about their ageing and a rapid depuration.

In all the instances cited, the ozonification process is of very great commercial value. Its cost is much below that of most ordinary chemical processes and the results are more advantageous. In a few processes using ozone the cost may be higher. They are, however, always quicker. With certain raw materials, the results aimed at can only be achieved with ozone.

Prospective Yields of Linseed Waste

Progress Towards Recovery of Industrial Fibres and Wax

THE prospect of more profitable development of the home grown linseed industry in the United Kingdom is being brought nearer by co-ordinated research from several differing angles aimed at finding profitable uses for the by-products. This is the subject of a summary issued by the Department of Scientific and Industrial Research, which has been working on this investigation in collaboration with research associations, universities and Government departments. The subject is treated fairly fully in the DSIR exhibit at the contemporary Nottingham Quincentenary Trades Exhibition.

One interesting aspect of such recovery is the possibility of extracting a wax, in addition to the fibre products.

The DSIR announcement discloses that more than 200,000 tons of linseed straw was produced here in 1948. Most of this was waste material, to be disposed of only by burning, for it takes several years to rot down under normal conditions. Investigation has ascertained that the straw, or its products, can be used in the paper, board, and linoleum industries, and a wax has been extracted from it. The fibre has been found to be a good substitute for jute.

The growing of linseed in Britain has been greatly increased in the last year or two because of the shortage of linseed oil. In 1948 the 86,000 acres producing linseed yielded about 2½ tons of straw per acre.

There are three residual materials that might be made use of—the whole straw, the fibre, and the "shives," or woody part. All three can be utilised.

The whole straw can be used for making building board, paper, carboard and packing and insulating materials. A wax has been extracted from the straw which may prove commercially attractive. The wax can also be extracted from the fibre, shives, and the dust arising from processing the straw.

The fibre produced from the whole straw can be spun as a textile and both the long line fibre and the shorter tow have been spun successfully on existing jute machinery. The resulting yarn has a strength compared with jute yarn of nearly 75 per cent. Jute, all of which has to be imported, now costs five times as much as it did before the war.

A powder made by grinding the shives has been used experimentally to make linoleum, replacing the wood flour which at present forms the filler. The shives, bonded with plastic, also make building board, and can be burned as a fuel.

AMERICAN CHEMICAL NOTEBOOK

FROM OUR NEW YORK CORRESPONDENT

COLD fog can now be dispersed by the same "seeding" techniques scientists use to convert clouds into rain and snow, according to Dr. Vincent J. Schaefer, of the General Electric Research Laboratory, Schenectady, New York, who is a pioneer in the modern attempts at weather control. Scattering small quantities of dry ice or similar particles in a supercooled ground fog will cause the water droplets to gather into ice crystals so heavy that they can no longer remain airborne, he says. In warm weather the ice crystals melt as they descend to the earth and turn into rain. "It would be foolish to think that such results can be obtained immediately," the doctor states. Many careful quantitative research experiments must be conducted before eventual success in this field can be expected.

* * *

The U.S. Department of Justice has announced that the patent relating to the German-developed Lowenstein-Fiedel process of producing hydrogen peroxide is now available for licensing from the Office of Alien Property on a royalty-free non-exclusive basis. The technical data regarded as essential in the operation of the process is also available though not part of the patent. The process was originally developed in Germany and was the property of J. D. Riedel de Haen, a German firm, until it was seized by the United States during the war. The unpatented information essential to the process was, until recently, licensed to two American companies by the German firm. By their licensing agreements these firms were bound not to disclose the information until March 28, 1949, when the basic patent covering the process expired. Patent No. 1,937,682, the one now being offered by the Office of Alien Property, is an improvement on the basic patent. Information necessary for its operation is contained in an exhaustive report. A copy of this patent (an improvement over patent No. 1,851,961, which has now expired) may be purchased for 25c. from the Commissioner of Patents, Washington 25, D.C.

* * *

Plans for the future production of uranium are expected to form the basis of discussions between the U.S.A., the United Kingdom and South Africa, according to the U.S. Atomic Energy Commission. Informal discussions, which the two countries have had with the Union of South Africa over a period of years, have been confined to the problems involved in producing uranium occurring in the South African gold ores. In the proposed discussions, the commission announces, it is expected that representatives of America and Great Britain will visit South Africa, at the invitation of the Union Government, to give further consideration to these matters.

* * *

The Economic Co-operation Administration has announced the signing of an industrial guaranty contract with the Metallising Engineering Company, Inc., of Long Island City, New York, which is planning a $45,000 investment in the United Kingdom. Metallising Engineering is a manufacturer and supplier of equipment and materials for metal spraying in the repair and salvage of industrial machinery. It will soon start production and distribution operations with a British associate at Chobham, Surrey. The American firm has been exporting to England and other countries for a number of years. Its business in Great Britain is expected to total about $400,000 yearly when peak production is reached in about three years. Of this amount, about one-half is to be exported from the U.K. to nations outside the dollar areas. The contract was executed by the Export-Import Bank, Washington, and is one of a series designed to encourage American industry to invest dollars that will assist European recovery. The contract assures conversion of foreign currency receipts into dollars, up to the amount of the dollars invested.

* * *

A new gas-treating plant to extract hydrogen sulphide from the natural gas from wells operated by the Pure Oil Company, and a sulphur recovery plant to reduce the hydrogen sulphide to elemental sulphur are being erected by the Texas Gulf Sulphur Company at Worland Dome, Washakie County, Wyoming. Extraction of the hydrogen sulphide from the natural gas will be by the Girbotol process developed by the Girdler Corporation, which is the general contractor for the new project, supplying the engineering, design and all the equipment.

Metallurgical Section

Published the first Saturday in the month

Silver *can handle* **bromine**

Silver is the only metal suitable for the construction of certain types of equipment, which has good resistance to bromine and its compounds. The diaphragm-sealed needle valve illustrated is used for handling liquid bromine. All parts in contact with the fluid are of pure silver : the operating mechanism is completely sealed. It is available in a range of standard sizes up to ⅜ inch bore.

One of the specialised services of

Johnson Matthey

For further information of Johnson Matthey services in this field write for Data Sheet 2610, " Chemical Process Plant ".

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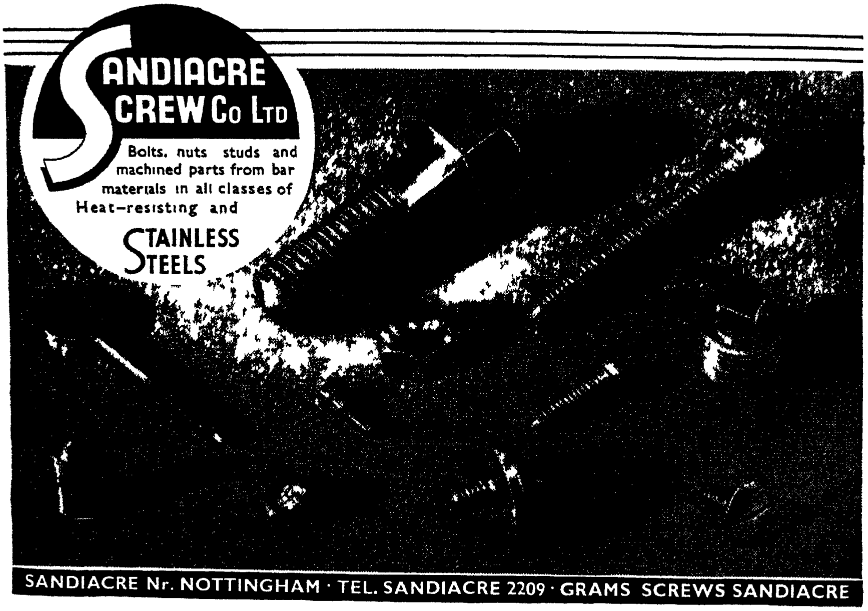

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Metallurgical Section

2 July 1949

WORLD TIN SURPLUSES

International Tin Group Seeks Regulation

AS an example of the rapidity with which a widespread post-war shortage can be converted into a surplus the record of world production and use of tin may be unique. This is evidenced by the fact that one of the subjects receiving most attention from the International Tin Study Group at its meetings in London last week was the setting up of machinery by which world production and use might be more closely related and the effects of over production mitigated.

The fourth meeting of the group, of which Mr. W. G. Fergusson was elected chairman, was attended by representatives of Australia, Belgium, Bolivia, British Colonial and Dependent Territories, Canada, China, Czechoslovakia, France, India, Italy, Netherlands, Thailand, United Kingdom, and the U.S.A. Observers from the United Nations, the Organisation for European Economic Co-operation and the Tin Research Institute also attended.

The imminence of the prospect of severe over production of tin was foreseen in estimates prepared by the group of future world output and consumption. They were as follows:—

	Production Tons	*Use Tons	*Excess production
1949 ...	170,000	138,000	32,000
1950 ...	190,000	158,000	32,000
1951 ...	205,000	162,000	43,000

*Commercial purposes.

It was recognised that these forecasts were subject to many modifying factors and that they did not make allowance of stockpiling purchases (by the U.S.A.), which are in any case an uncertain quantity.

The group reported that: "The estimates indicated an existing and growing excess of production over commercial consumption, but took no account of purchases for non-commercial purposes. The group had insufficient information before them to enable them to say to what extent and for what period of time such purchases would be effective in averting disequilibrium. They did, however, understand that there was a reasonable prospect that such purchases might maintain an equilibrium for an appreciable period ahead.

"They were unable to determine how long this period might be, but considered that a burdensome surplus of the kind which can be regarded as justifying the conclusion of an International Commodity Control Agreement might well arise within the next five years."

The most important decision by the group was to establish a working party to review tin industry prospects, and to draft a commodity control agreement which, if acceptable to all members, could go before an International Commodity Conference convened by the United Nations.

The urgency of some form of international regulation, in the view of the tin producers, is reflected by the fact that the working party has been asked to report within three months, if possible.

Reports from all world centres of production indicate there has been substantial limitation of tin concentrates, tin metal and tin plate, which was particularly evident in March and is not likely to have been reversed since then.

THE American Zinc Institute has just published a 64-pp. booklet, "The Zinc Industry," which gives an interesting and informative outline of zinc from mine to market. It points out that the work is not intended as a technical treatise, but deals with production and consumption in sufficient detail to give those interested a wide picture of the zinc industry in America and elsewhere. The text is illustrated and up to date. Copies are being sent without charge by the American Zinc Institute, Inc., 60 East 42nd Street, New York 17, N.Y.

Price Prospects i

U.S. View on

SOME of the factors which influenced the spectacular recent falls in the price of lead in the U.S.A.—and indirectly the price in this country—were reviewed last week by Mr. Robert Lindley Ziegfeld, secretary of the Lead Industries Association, New York, in an address to a meeting of the Idaho Mining Association. He predicted a return to normal marketing and buying operations and in general painted an optimistic picture for the remainder of the year, with certain exceptions.

There appeared to be a promising outlet for lead in battery manufacture, the industry estimating that during the last six months of 1949 it will produce some 12 million batteries. It was noteworthy that the weight of lead per battery had been increasing in the last few years, having risen from about 22 lb. to about 27 lb.

Optimism also centred about the consuming potentialities of the tetraethyl lead industry, which had grown from nothing a little over 20 years ago to a lead consumption of about 80,000 tons per year. Further growth was expected in this connection through the use of more cars and higher compression engines. It had been estimated that the use of tetraethyl lead might more than double in the next five years.

The recently announced reductions in the price of lead were expected to result in its increased use in cable sheathing,

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X-RAY GAUGING

USING one of the newer instruments of industry, an X-ray thickness gauge, the Wierton Steel Company. Wierton, West Virginia, reports that it has made possible the production of more uniform steel strip than was possible using mechanical gauges. Installed along the run-out table immediately beyond the finishing stand of the company's 54-in. hot strip mill, the gauge continuously measures the thickness of strip which passes it at the rate of approximately 1700 feet per minute.

It is stated to have enabled workers to reach gauge on the first strip, whereas formerly four strips would go through the mill before a report on the gauge was obtained. This is particularly advantageous when rolling short orders.

n Lead Industries

Recent Declines

building construction, water distribution and plumbing, and in chemical construction, where lead was employed to fabricate corrosion resistant equipment. There was no doubt that considerable chemical construction was being held in abeyance until costs and business generally showed signs of stabilising. Lower prices for lead should help to some extent competitively.

Mr. Ziegfeld stressed that U.S. Government stockpiling of lead had accounted for substantial quantities of the metal since the stockpiling programme got under way, and it was expected that sizeable purchases would be made by the Government in the new fiscal year starting July 1.

Referring to the recent fluctuations which, he said, had ended in the most precipitous price drop of lead in history, Mr. Ziegfeld recalled that the end of the war had brought a " terrific " demand for lead products, since the public had been unable to buy many of the things they needed and wanted. Huge consumption of lead in the years following the war finally caught up with the filling of this demand, and when dealers' and manufacturers' shelves were filled with lead products ultimate consumption dropped back to normal, and buying of the raw material—pig lead—virtually stopped. As those inventories of lead products worked off, lead manufacturers were bound to re-enter the market.

OF STEEL SHEET

The operating department of the steel company states that, because of the gauge, they have been able to adjust the water sprays so that the tail end of the strip is more nearly the same gauge as the front end. This permits better welds on the pickle line, and results in a better product for rolling on the high speed tandem cold strip mills.

As the strip leaves the last of the six finishing stands on its way down the run-out table, it is moving at almost 20 m.p.h. between an X-ray tube located in a steel tank beneath the run-out table and a radiation detector located above the table. It absorbs some of the X-rays passing between these units; the amount of energy absorbed being an indication of its density or thickness.

HIGH-DUTY SILICON IRON

Components of Resistant Chemical Equipment

by R. V. RILEY, Ph.D., B.Sc., A.I.M.*

IRON-silicon alloys containing upwards of 14 per cent silicon have been well known in the chemical industry since the discovery of their excellent acid-resisting qualities by Jouve, a French metallurgist, in 1908. Despite the discovery of stainless steels, high chromium irons, nickel-silicon and nickel-molybdenum alloys and the continued developments in the application of lead, ceramics, fused silica, noble metals and plastics, silicon iron is still favoured as a constructional material for acid plant.

Hitherto in most of the industrial applications, castings of acid resisting silicon-iron have been employed only in a relatively unstressed condition, working either at atmospheric, or at the most, water gauge pressures of not more than a few inches. It may not be generally realised that this alloy can be used under any other conditions. Of recent years, however, owing to the great improvements in its consistency, strength and reliability, silicon-iron is becoming increasingly used for plant working at relatively high temperatures and pressures.

Sulphuric Acid Resistance

From the standpoint of corrosion resistance, silicon iron represents a metal eminently well suited for the manufacture of equipment for sulphuric acid concentrating plant. Throughout two world wars it has stood alone as the most satisfactory commercially available material for this type of acid plant.

Recent developments in chemical engineering have resulted in the production of a new type of sulphuric acid concentrator which makes very severe demands upon the alloy. The Simon Carves group was responsible for the introduction to this country of this plant in which weak sulphuric acid is brought up in strength to 98 per cent under fume-free conditions by means of a vacuum concentrator. The silicon iron parts of these concentrators were produced by Bradley & Foster, Ltd., Darlaston, Staffs., where the various castings were executed in Hypersilid 14 16 per cent alloy.

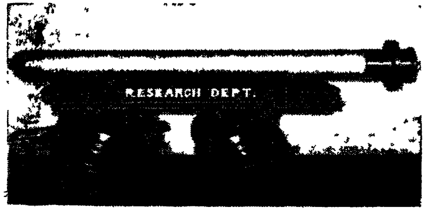

Fig. 1

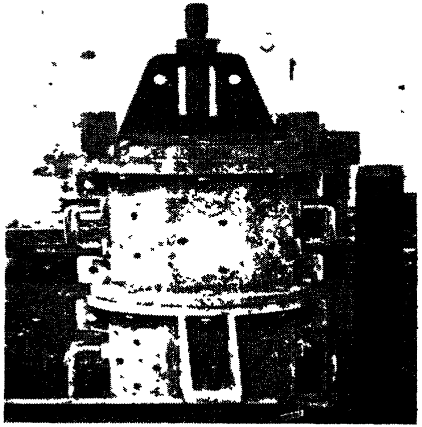

Fig. 2

Heater Tube Castings

A vital part of the concentrator is a heater tube, having a closed end, totally immersed in dilute sulphuric acid and carrying live steam at about 100 p.s.i. Two types of heater tube have been made in silicon iron; the first were 5 ft. long by 7 in. outside diameter, and the second series were 6 ft. long by 7 in. outside diameter.

The finished casting shown in Fig. 1 which is an example of the larger type

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* Research Manager, Staveley Iron and Chemical Company, Ltd., Nr. Chesterfield.

of tube, weighed 318 lb. The minimum thickness of this heater tube at any point was ¾ in. and maximum was 15/16 in. The variation in wall thickness between any four places at any selected section had not to exceed ⅛ in., provided none of these measurements fell outside the former limits of thickness. The tolerance on wall thickness for the un-machined sand casting was therefore ± 1/16 in. The maximum permitted departure from the straight was ¼ in. over the 6 ft. length of tube.

The open end of the tube was provided with a flange 11½ in. diameter and a projecting spigot which terminated in a cone end joint. The flange and jointing section were machined on all faces. Silicon iron is a very hard alloy and the machining of this end was a grinding operation.

Foundry Technique

As it is not permissible to make silicon iron castings with chaplets, the whole of the core for this blind-ended tube had to be located and secured in position from the open end. To work to the desired fine tolerances necessitated special mechanical arrangements to hold the core rigidly in position during casting. The unique moulding box and core assembly shown in Fig. 2, was used. This consisted of a two part box of hexagonal cross-section, having open ends which were accurately squared and machined to provide locating faces for a loose nose end moulding box at one end and the special core barrel collet at the other.

The core was made by loam moulding on a machined core barrel working in machined bearings. The loam board was a fixture. A loose plug of the same diameter as the core barrel served as one of the journals during core making and for handling purposes during stoving. This plug was screwed from the end of the core barrel just prior to setting up in the mould, the hole being made up with loam. Wood wool rope wound on to the core barrel served as a foundation for the loam which was of special consistency calculated to collapse readily after the pouring of the iron.

The moulding box was stood on end in a pit suspended from brackets on the side, leaving 3 ft. clearance at the bottom. The mould was hand rammed around a full length steel pattern located in the collet at the top and a removable ring at the bottom. A natural sand was used, blended to give a dry sand mould having adequate strength when stoved, but being readily collapsible after pouring.

The mould was rammed with the detachable nose box in position. This small box was removed from the mould from underneath to enable the core to be set accurately.

The nose end mould was replaced for casting. The flange and cone contour of the open end of the tube were obtained by means of an oil-sand core which also served as a pouring basin, filling the mould via pencil sprues.

The mould was cast with silicon-iron at a temperature of 1320° C. (optical) and exactly 17 minutes later the core barrel was drawn. The mould was removed from the pit, put on its side on the foundry floor and the box opened, to ease the sand around the flange. The casting was then left to cool slowly in the box.

Each casting was subjected to an extremely thorough and extensive programme of inspection and testing by the manufacturers and a final inspection in the presence of representatives of Simon Carves, Ltd., a boiler insurance company and the customer.

High-Duty Tests

The first inspection of the casting was made before machining by the works inspector. Dimensional checks were carried out, using a specially designed wall thickness measuring machine. The quality of the inside of the tube was then approved by a detailed examination with the Foster Intrascope, an optical device which enables the eye to see every part of the internal surface of the tube, including the closed end. A casting passing this first inspection was then hydraulically tested at 100 lb./sq. in. and approved for machining.

When the grinding of the flange and open end of the tube was finished, the casting was transferred to an acid pickling tank for treatment at 80° C. in 30 per cent sulphuric acid until all effervescence ceased. There followed a final check upon dimensions in the presence of outside inspectors and a pressure test with kerosene under 400 p.s.i. for 30 minutes. No pressure drop under this test was allowed.

Silicon iron for high-duty castings requires very careful preparation. Electric furnace melting of the iron is employed at Bradley & Foster, Ltd. An ingot is made from carefully selected raw materials, refined pig iron, steel scrap and high grade ferro silicon. It is very important to select only raw materials known to be low in hydrogen. The ingot is remelted together with foundry scrap in a 30-cwt. three-phase, direct arc furnace.

The metal for castings must be checked for gassiness before using. This practical test is made by pouring a sampling spoon of molten iron into a prepared sand mould and during solidification its surface is carefully watched for signs of bleeding back.

Hydrogen content of silicon iron must be kept below 2 mls./100 gms. to avoid porosity. It is equally important to prevent the approved iron making contact subsequently with any wet patches on the lip of the ladle or damp runner bushes, and furnace repairs must be carefully dried out before melting silicon iron.

It is important also to keep the carbon content of the iron within the optimum range, which with the Hypersilid alloy, is 0.60 per cent to 0.65 per cent. This ensures the absence of kish inclusions on the one hand and undue shrinkage on the other. For adequate resistance to corrosion, the silicon content is kept about 14.5 per cent. The manganese and phosphorus are 0.6 per cent and 0.2 per cent respectively.

The physical and mechanical properties of Hypersilid alloy are represented in Table 1. It is convenient to compare silicon iron with cast iron and with stone-ware, as all three materials are commonly used in the construction of chemical plant. When the outstanding acid-resisting qualities of silicon iron are considered along with the mechanical properties as revealed in the table, the reason for the success of this alloy in the chemical industry is self-evident.

Chemical plant in which silicon iron can be advantageously used need no longer be limited to low working pressures. (Some typical pieces are shown in Fig. 3.) The silicon iron heater tube using steam at 100 p.s.i., is an established fact. Other plant is known in which satisfactory performance has been obtained under mechanically stressed conditions and there is little doubt that a more widespread use may be contemplated.

TABLE I

PHYSICAL AND MECHANICAL CONSTANTS OF CHEMICAL-WARE

	Hyper-silid 14/16	Cast Iron	Stone ware
Weight in pounds per cu. ft.	428	445	136
Density in grams/cu. cm ...	7.0	7.3	2.2
Melting point °C. ..	1250	1200	1450
Specific heat	0.130	0.115	0.20
Coefficient of expansion ($\times 10^{-6}$)	12.0	12.1	4.5
Thermal conductivity (cals. per cm. per sec.) ...	0.078	0.110	0.0023
Electrical resistivity (micro-ohms per cu. cm.)	50	45	—
Hardness (Brinel) .	450	180	—
Tensile strength (tons/sq. in.) . . .	10.0	15.0	1.0
Transverse strength (tons/sq. in.)	18.0	30.0	—
Modulus of elasticity (E= lbs./sq. in. $\times 10^{-6}$) ..	17.0	19.0	—

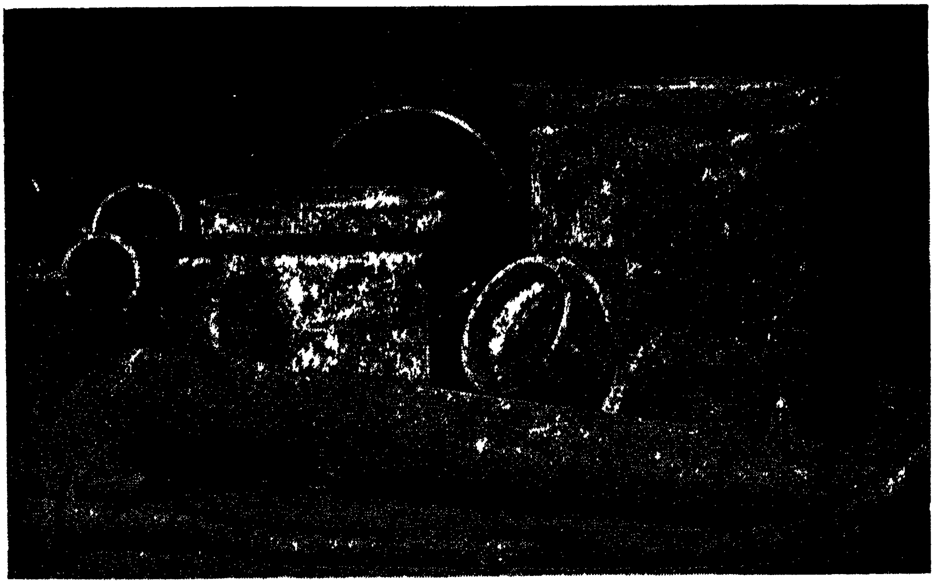

Fig. 3. Some complex castings in acid-resisting silicon iron

Recent Advances in Hard Metal Processes

English Patent Rights Sought

NEW methods for hard metal compositions are the subject of an English patent application by the American Electrometal Corporation, Yonkers, U.S.A.*

The invention relates more particularly to high speed tool elements, not only for machining metals, but also glass, synthetic resins, and laminated material. It has been already suggested to use hard particles of chromium boride with a suitable binder of nickel-chromium-boron alloy, and small additions of iron, silicon, or carbon. The chromium boride could be produced by any well known method, and may be a mixture of such borides. Minute particles of these are used to increase surface area, as is desirable for bonding with the cement or binder, and for reducing brittleness. Average particle sizes between 1 and 20 microns are suitable.

According to the present invention an alloy on metal base of cobalt or nickel is bonded with minute boride particles, preferably of one or more of the chromium borides. It has been found that cobalt can be used as binder if detrimental oxide films have been removed from the borides, *e.g.*, by suitable de-oxidising agents such as molybdenum or tungsten incorporated up to about 1 per cent weight of mixture.

This latter is then heated, preferably in inert atmosphere of argo, or neon, or in vacuum, up to 1000° C. for molybdenum, or 1200°C. for tungsten. The boride powder is thereafter mixed with cobalt (6-20 per cent by weight), cold pressed, and sintered well above m.p. of cobalt; or hot pressed at about 1800°C.

It has further been found that by addition of appreciable amounts of molybdenum, chromium, and/or tungsten to the cobalt, (*e.g.*, from 5-20 per cent of weight of cobalt), the heat and corrosion resistance of the product can be considerably improved. These elements combine, at least partly, in solid solution during sintering at the high temperatures named; and by heat treatment of the sintered or hot pressed body at 1000-1400° C. for a suitable time solid solution formation can be increased.

Some addition of nickel to the cobalt is useful; also, as stated, 5-10 per cent powdered chromium borides to binder, or metallic chromium may be so added, possibly forming an alloy or eutectic between binder material and the powdered borides during sintering under pressure. Iron may be added instead of nickel.

Many advantages are claimed for the use of chromium borides in a mixture with the elements mentioned. Tantalum or columbium (niobium) may be used instead of molybdenum or tungsten; and the compacting pressures recommended are 2000-3000 lb./sq. in.

Improving Impact Resistance

Better impact resistance in the manufacture of steels, articles and structural elements for use at low temperatures is claimed by the Mond Nickel Co., Ltd., in an English patent application.†

By low temperatures is meant down to about -310°F., as for example in containers for liquefied gases. For such purposes ferritic steel has been generally used, having a high impact resistance. But such steels are only suitable down to about —240° F., resistance drops sharply below that level.

It has now been found and applied in the present invention that the addition of nickel has a marked improving effect. Impact strength varies inversely with nickel content above -240°F.; but below that temperature and especially below -260°F., it varies directly with nickel content, the maximum of which should be 10-15 per cent, with 0.2 per cent carbon. Balance is mainly iron, though silicon up to 0.3 per cent and manganese up to 1.25 per cent (preferably less), also some titanium and aluminium, up to 0.1 per cent may be included.

These steels must be subjected to suitable heat treatment, *e.g.*, two heating steps known as pre-normalising and normalising, respectively. These are described in detail and the effect of varying nickel content is graphed.

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*(*Patent Application No.* 1883/1947; *conv. date* 30.7.46.)

†(*Patent Application No.* 21249/1947; *conv.* 2.8.46).

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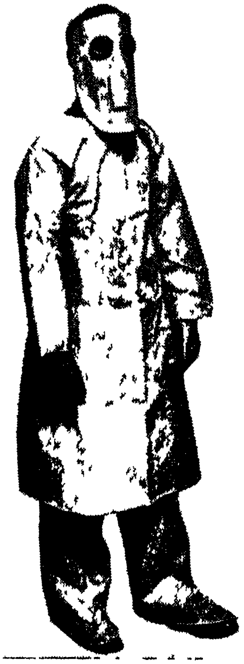
Technical Publications

A MODERN pulverising and grinding machine suitable for reducing sulphate and oxides, reducing drugs, resins and gums and blending pigments is the B.J.-D Atomil. This high-speed machine, which is adaptable to any site requirements, is described and amply illustrated by photographs and diagrams in a new catalogue (No. 1469) now available from British Jeffrey-Diamond, Ltd., Wakefield, Yorkshire.

* * *

THE advantages of chlorinated rubber in forming a tenacious, non-porous and non-inflammable film which resists most kinds of corrosive and deleterious materials and can be applied to almost any surface, are described in *Rubber Developments* (Vol. 2, No. 2) issued by The British Rubber Development Board.



Face shield with rubber framed goggles and clear lenses, smock, and overall leggings with spat front. An example of the many types of protective clothing for every industrial purpose illustrated in the booklet now issued by Wallach Bros., Ltd.

ALUMINIUM and its alloys, because of their immunity from attack by many reagents, are widely used in the chemical industry, and latterly in a host of other applications. In its latest illustrated brochure, "Aluminium in Service," the Aluminium Development Association has selected a number of examples to show the behaviour of aluminium and its alloys in many different fields and durability of service, varying from 50 years to concentrated wear and tear of only a few hours.

* * *

A COMPREHENSIVE list of welding accessories from electrode holders, plugs and sockets, carbon brushes, etc., to respirators, helmets, handshields and protective glasses and protective clothing, designed to withstand severe conditions in practical service is now obtainable from Murex Welding Processes, Ltd., Waltham Cross, Herts., in its new illustrated catalogue M.41. This also contains a useful list of other available Murex publications.

* * *

THE revised editions of four very useful technical commentaries on base exchange materials were issued last week on behalf of Joseph Crosfield & Sons, Ltd. These are: Technical publication No. 22, Soucol Brand Carbonaceous Cation Exchange Material; No. 23, Doucil Brand Base Exchange Material—data for use in the design of water softening plants; No. 24, Doucil Brand Bass Exchange Material—data for use in the design of domestic water softeners; No. 25, The Lime and Soucol Process (for pre-treating natural waters for boiler feed).

* * *

AN introductory booklet for students or trainees in the industry, "Plastics Inspection," an illustrated manual dealing with the nature of plastics materials, their methods of fabrication, properties and tests, is now available from the Office of Technical Services of the U.S. Department of Commerce, Washington, D.C. It costs $2.75. Among its contents are a timetable on the development of commercial plastics, flow charts for the production of the more common types of plastics and diagrams and photographs of test specimens and apparatus. An appendix deals with the raw materials and processes used in the manufacture of plastics and there are about 150 photographs, drawings and charts.

The Chemist's Bookshelf

HAPPIER DAYS. Recollections and Reflections of Sir Ernest Benn. 1949. London. Ernest Benn, Ltd. Pp. 222, 8s. 6d.

The immense advantage of having lived for 74 years consists in having seen a great diversity of men and events and had the opportunity of evolving a scale of values by which current happenings can be focused. Sir Ernest Benn has had both and has made good use of them and especially of the heightened capacity for seeing current events in the scale of what has gone before. In that light, the glamour which might be supposed to invest the great recent advances towards a brave new world—in which inconvenient economic factors are to be laid to rest and vexing personal responsibilities will be handled by the State or some beneficent committee—parts with whatever gilt the friction of events has left on it. The author himself explored some of these selfsame paths 30 years ago and was deceived —but not for long—by the roseate prospect of equal sharing of responsibility in industry and some of the other attractive mirages which Socialist policy still uneasily preserves. It is, however, as an evocation of the life and personalities of this country during the past half century, enriched with an abundance of intimate detail, that this book appeals most. It may well evoke nostalgia as well in those fortunate enough to have known the "happier days," when a suite at the Savoy was had for £2 10s. a week and the simpler luxuries of a full family life cost weekly less than does a meal in a restaurant now.

The scope of the book is, however, much wider than the domestic scene which it brings so fully to life. It calls into view several great, and some notorious, characters whom the author as a publisher had good opportunities to study. It tells moreover in characteristically vigorous terms of the political and social changes which have robbed the country of more than its rich colouring and its inhabitants of their full individualised ways of life.

JOURNAL OF THE ELECTRODEPOSITORS' TECHNICAL SOCIETY. 1947-48, Vol. 23. 1949. London: 27 Islington High Street, N.1. Pp. viii + 239, and index; to non-members, 2 gns.

This volume comprises papers read and discussions during the winter 1947-48, already issued in paper unbound form, with the report of annual meeting (1947). During this, the 22nd session, membership continued to rise—to a total of 900. Ten meetings were held in Birmingham and 10 in London (Northampton Polytechnic), and 18 papers were read, of which 12 are published in the Journal.

In his presidential address on the relation of electrodeposition to electrochemistry, which stimulated a keen discussion, the president, Dr. G. E. Gardam, raised questions of the present relations between theory and practice which have interest not confined to the spacious territory of electrochemistry. So far as the latter is concerned, there appears to be some lack of co-ordination and it is found that "theoretical electrochemistry is less fruitful than would be expected." If much of the theory has seemed barren to the practical electrodepositor, it must be conceded that it has proved extremely interesting and perhaps helpful in the mathematical or philosophical study of matter. The subject of education and training is accordingly complex, as Dr. Gardam recognised, it being necessary to distinguish between the practical plater and the research worker. They are not usually one and the same.

Several of the papers in the present volume deal with metal polishing, which also figured prominently, it will be remembered, in the 3rd International Conference proceedings. Others are concerned with plating shop practice and layout. An interesting paper came from Czechoslovakia, by Prof. A. Glazunov, on the danger of "masked pores" and methods for their determination. Thickness testing, the interest and importance of which is constantly increasing, was the subject of two papers, including the jet-test for lead coatings. Speculum plating also is reviewed in two papers. Some of the latest developments in the production of electro-formed moulds for plastics and die casting—an important, rapidly growing field—were described in a fairly long paper by P. Spiro; and the topical interest and importance of Dr. Wernick's discourse on plating costs and their reduction, which is a paramount need today, well justified its 25 pages.

HOME

Surplus Equipment.—Surplus Government electrical, chemical and steam raising equipment is to be sold by auction during July 5-7 at the Ministry of Supply Depot, Valley Works, Rhydymwyn, near Mold, Flintshire.

Engineering and Marine Exhibition.—THE CHEMICAL AGE, together with other publications of Benn Brothers, Ltd., will be represented on stand 21, Inner Row, at the Engineering and Marine Exhibition to be held at Olympia, London, from August 25 to September 10.

End of Chemical Disposals Body.—The Pharmaceutical and Allied Chemicals Disposals Association, Ltd., 166 Piccadilly, London, W.1, which was formed in 1945 to dispose of Goverment surplus stores of pharmaceutical products has now been wound up.

Detection of Mine Gases.—Urgent need for further research in the detection and estimation of mine gases such as methane, carbon monoxide, and oxides of nitrogen is emphasised in the 26th annual report on Safety in Mines Research just issued by the Ministry of Fuel and Power. This is necessitated because of the introduction into the pits of diesel engines and the new ventilation regulations.

Shale Oil in Scotland.—Revived interest in low grade shales—which are being reclaimed and refined by modern methods—has encouraged hope in Scotland that the Fife shales and cannels may prove suitable for refining. During the 19th century oil was produced at various points in Fife from cannels and parrots-seams rich in oil. Projects for the major expansion of mining in Fife suggest the possibility that many of the seams formerly used for refining purposes may again be tapped. Improved methods of distillation are expected to offer justification for such a revival.

Awards for Students.—A series of awards to be known as the Evans Pharmaceutical Prizes, consisting of books or apparatus to the value of ten guineas, has been founded by Evans Medical Supplies, Ltd., to be presented to 18 institutions in Great Britain. The prize will be awarded to the student at each institution who is adjudged to be the best in pharmaceutics during the final year of the course for the Chemist and Druggist Qualifying Examination, or the first post-intermediate year of the course for the Pharmaceutical Chemist Qualifying Examination, or the corresponding year of the course for a degree in pharmacy.

Studying U.S. Methods.—A team of 16 men from British drop forging plants have arrived in New York to begin a six weeks' study of American methods of producing steel forgings. The team will visit 11 steel plants in six States and one in Canada.

Possible Welsh Lead Source.—The news that the lead mines at Llanrwst are being surveyed with a view to the possibility of reopening them was given at a meeting of Caernarvonshire Industrial Development Committee at Caernarvon on June 23.

Coal Output Lower.—Provisional figures of coal production for the week ended June 25 issued by the Ministry of Fuel showed a total of 4,319,100 tons (deep-mined 1,026,200 tons and open-cast 292,900 tons). This was 20,200 tons less than the previous week.

Fuel Research Centre.—The Fuel Research Station of the Department of Scientific and Industrial Research at Thorntonhall, East Kilbride, which will employ about 100 scientists and technicians, is expected to be in full operation in July. Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, inspecting the station last week, said that in future prototype fuel appliances would be tested at East Kilbride, instead of Greenwich.

Bigger Plastics Exports.—Exports of plastics materials in 1948 amounted to 19,300 tons, or five and a half times the quantity exported in 1938. These figures were mentioned by Mr. Harold Wilson, President of the Board of Trade, at the annual luncheon of the Plastics Institute held in London last week. Mr. Wilson said that our largest markets for plastics materials were Australia and India, but no less than 12 per cent of the exports so far this year had gone to hard-currency areas.

Exports and Research.—Mr. Arthur Woodburn, Secretary of State for Scotland, visited the factory of British Dyewood, Co., Ltd., Shettleston Road, Glasgow, on June 24. At a subsequent Press conference, he observed that the company, concerned mainly with the manufacture of medicinal products, was now exporting 140 per cent of its original output and making a substantial contribution to the export drive. The company is setting up an advanced research department under the care of Prof. W. M. Cumming, now professor of technical chemistry at the Royal Technical College, Glasgow.

OVERSEAS

South African Cosmetics and Perfumes.—South African manufacturers are planning laboratories for the production of basic ingredients of perfumes and cosmetics, in consequence of the drastic control of imports.

Brazilian Iron and Steel.—According to the report for 1948 issued by the Brazilian Volta Redonda Iron and Steel Works, the largest unit of its kind in South America, pig-iron production amounted to 220,000 tons and steel output to 240,000 tons. In addition 260,000 tons of coke, 2.7 million litres of liquid fuels and 8 million tons of tar for road making purposes were manufactured.

Norwegian Metals Expansion. — The Falconbridge nickel factories are to develop and modernise their plant at Kristiansund. Production of electrolytic nickel will be increased by 50 per cent. Production of cobalt and nickel sulphate will also be transformed and later there will be an annual production of 14,000 tons of nickel and 7000 tons of copper.

India Frees Paint and Varnish Exports.—In pursuance of its policy of progressive liberalisation of export control, the Government of India has decided that exports of paints, enamels and varnishes, containing lead and/or zinc, which were hitherto allowed on a quota basis only, will be licensed freely to all permissible destinations for a period of three months, the first instance, from June 1.

Sodium Nitrate Recovery.—An application has been made by the Compania Salitrera Anglo-Chilena for water rights in connection with an evaporation plant for the production of nitrate of soda and similar products. This method of increasing total output is of interest because the residue nitrate and other valuable by-products will be extracted from the dumps left over from the working of other extraction processes.

Spanish Potash Plan.—The report of the Banco Urquijo presented to the General Assembly mentions that the plan for 1950 for the potash industry proposes the production of 200,000 tons, rising to 250,000 tons in 1952. This should permit the export of 140,000 and 190,000 tons respectively. Before the civil war, production was 70,000 tons of which 71 per cent was exported. Last year production was 150,000 tons, of which two-thirds was exported. To reach the production envisaged, personnel will be increased and separating machinery imported.

Cape Aloes.—Intensive harvesting of aloes for medicinal use has been proceeding at the Cape and in the south-west area of South Africa. Large quantiities are exported, and it is claimed that Mossel Bay, Albertinia and Riversdale are now the world's chief production areas.

Indian Duty Prolonged.—The protection afforded to the calcium chloride industry in India, which was due to expire on March 31, 1949, has been extended up to March 31, 1950, by the Protective Duties (Miscellaneous Provisions) Act, 1949. The duty is Rs. 4-14-0 per cwt. (standard) and Rs. 3-4 0 (U.K. Preferential).

U.S. Sulphur Output Up.—Production of sulphur in the U.S.A. in March reached a total of 402,711 long tons, an increase of nearly 15 per cent over the previous month. The total for the first quarter of 1949 was 1,170,475 long tons, only slightly lower than the first three months of 1948. Apparent sales in the first quarter of 1949 were 7660 long tons more than in 1948.

Israel Penicillin Project.—Business interests in the U.S. Switzerland and Scandinavia are planning the production of penicillin in Israel on a large scale. The plant envisaged, which would require an outlay of about £500,000, would also produce streptomycin, tyrothricin, and other medical preparations. It is hoped to develop a large export market.

Nigerian Oils for Britain.—A three-year agreement for the supply of oils and oil-seeds to Britain was signed last week by Mr. John Strachey on behalf of the Ministry of Food, and Sir Sydney Phillipson, chairman of the Nigerian Produce Marketing Co. The contract is from January 1, 1950, and will ensure a continuation of supplies. They are expected to total 900,000 tons a year in terms of raw materials, or 500,000 tons in oils and their equivalent—about the same as in previous years.

Swiss Chemical Exports Drop.—Official Swiss statistics show that exports of chemical and pharmaceutical products declined from Fr. 37.2 million in April to Fr. 35.7 million in May. While shipmeents of aniline dyes and indigo rose from 14.6 to 15.5 million Swiss francs, those of industrial chemicals fell from 7.3 to 5.5 and sales abroad of pharmaceutical products declined from 15.3 million to 14.7 francs. Sales of perfumery at 2 million francs were lower by 100,000 francs.

PERSONAL NEWS

Prof. E. C. Bullard, professor of physics in the University of Toronto, has been appointed by the Lord President of the Council to be director of the National Physical Laboratory. He is expected to take up his post in January, in succession to Sir Charles Darwin. In 1931 the professor was made demonstrator in geodesy when that post was created at Clare College, Cambridge. He was elected to the Smithson Research Fellowship of the Royal Society in 1936 and during the war he carried out important work for the Admiralty on de-gaussing of ships against the magnetic mine. The professor was made a Fellow of the Royal Society in 1941.

Mr. David A. Shephard, chairman of the Anglo-American Oil Co., Ltd., since 1945, has resigned to take up a position in New York as executive assistant to the president of Standard Oil Co. (New Jersey). He will be succeeded by Mr. R. A. Carder, who will continue to act as managing director, a post which he has held since 1939. Other appointments announced by the Anglo-American Oil Co., Ltd., are that of Mr. Leonard Sinclair as an additional managing director, and Mr. Howard W. Page, executive assistant to the president of Standard Oil Co., Ltd., as director.

The Croonian Lecture for 1949 was delivered at the Royal Society, London, last Thursday, by Dr. W. Bronk, Foreign Member. He discussed "The Rythmic Action and Respiration of Nerve Cells." Dr. Bronk is foreign secretary of the National Academy of Sciences and chairman of the National Research Council of the U.S.A. As director of the Johnson Institute for medical physics, Pennsylvania University, he has greatly influenced the development of biophysics in America.

The Latin of the Public Orator was put to a severe test in dealing with such modern topics as jet engines and nuclear physics when Sir Frank Whittle and Sir John Cockroft, director of the Atomic Energy Research Establishment at Harwell, both of whom received the D.Sc., were among a distinguished gathering on whom honorary degrees were conferred at Oxford last week.

Prof. E. C. Bullard

At the banquet to delegates of the Fourth Empire Mining and Metallurgical Congress in Guildhall, London, on Monday, July 11, the president, Sir Henry Tizard, will propose the Loyal toast and the toast of the Royal family, to which H.R.H. The Duke of Gloucester will reply. "The Mineral and Metal Industries of the British Empire" will be proposed by Mr. H. T. N. Gaitskell (Minister of Fuel and Power) and responded to by Mr. H. C. Rickaby, deputy Minister of Mines, Toronto. The reply to "The Guests" will be given by the Lord Mayor of London and Mr. D. G. Malherbe, Government Mining Engineer, Union of South Africa.

Mr. H. M. Goody has been appointed managing director of Cantie Switches, Ltd., following the removal of the business from Chester to a new and larger factory at New Ferry, Bromborough, Cheshire. Mr. Goody joined the associated company of Brookhirst Switchgear, Ltd., in 1920, became a director in 1937, and in 1941 was appointed joint managing director.

Obituary

The death was announced recently in Berlin of Prof. Otto Liebknecht, 73, professor of chemistry, Humboldt University.

The death occurred in Huddersfield last week of Mr. William D. Penly, 62, chief pyrotechnist at the Standard Fireworks Co., Huddersfield, where he had served nearly 40 years. His father and grandfather were also pyrotechnists.

FULLER COLONIAL RESEARCH

£2½ Million Yearly

UNDER the Colonial Development and Welfare Act of 1945 no more than £1 million a year might be spent on Colonial research, said Mr. Creech Jones, Secretary of State for the Colonies, recently, when introducing the second reading of the 1949 Act. This new Bill proposes to increase to £2½ million the annual amounts payable from public funds for carrying out schemes under the Acts of 1940 and 1945.

Centred on London

When the Colonies were allocated funds under the 1945 Act for their ten-year plans, said Mr. Creech Jones, it was also proposed that there should be a number of centrally organised services, mostly in London. These included training schemes for the Colonial Service, higher education, and survey work, as well as research. To finance them, over £23.5 million was set aside under the Act, of which some £10 million was available for research, which was co-ordinated by the numerous colonial research committees in the United Kingdom.

At the end of March this year the sums spent on research amounted to £1,541,000. Under the Act, 319 research schemes had been approved, and it was estimated that 40 per cent of the expenditure involved was on agriculture, veterinary and forestry research, 13 per cent on fisheries, 10 per cent on medical research, 9 per cent on tsetse, 5 per cent on insecticides, and 5 per cent on products research, etc. About 30 per cent of the work was likely to be carried out in East Africa, 20 per cent in West Africa, and 15 per cent in the West Indies.

Expenditure on research schemes in the year ending March 31, 1949, was about £750,000, nearly half the total amount spent up to that date, and it was expected that in the coming year expenditure would amount to some £1.6 million.

The organisations that dealt with the problems of research were not only in the United Kingdom. New centres of research were being created in the Colonies and experimental and demonstration work was being encouraged. Research institutes were being attached to the new colonial universities and university colleges, and special missions were undertaking investigations in every field. In these and other ways the basic knowledge necessary to tackle the problems involved in development work was being acquired and applied.

NEXT WEEK'S EVENTS

MONDAY, JULY 4

Royal Institution

London: 21 Albemarle Street, W.1, 5.0 p.m. General monthly meeting.

TUESDAY, JULY 5

Commonwealth and Empire Health and Tuberculosis Conference

London: Central Hall, Westminster (until July 8). Discussions; visits to hospitals and sanatoria; exhibition of X-ray apparatus and pharmaceutical products, technical books, etc.; tours of general interest and social events.

THURSDAY, JULY 7

The Royal Society

London: Burlington House, Piccadilly, W.1, 2.15 p.m. Prof. A. V. Hill will open a discussion on "Muscular Contraction and Relaxation: Their Physical and Chemical Basis." Contributions are expected from: Prof. W. T. Astbury, F.R.S., E. J. Conway, F.R.S. (Dublin), M. Dubuisson (Liège), H. H. Weber (Tübingen) and Dr. Dorothy Needham, F.R.S. 10.15-12.45 a.m.: Demonstration of experiments in the Biophysics Research Unit, University College, London.

Underground Mining Machinery Exhibition

London: Earls Court (until July 16).

FRIDAY, JULY 8

Photoelectric Spectrometry Group

London: Institute of Physics, 47 Belgrave Square, S.W.1, 2.30 p.m. Dr. W. C. Price, Dr. M. H. F. Wilkins and G. Brown of King's College: "Selected Topics in Ultraviolet Spectrophotometry" (including spectra of hydrocarbons in the near and vacuum ultraviolet, biological applications and low temperature techniques); Dr. A. Elliott (Courtaulds Ltd., Research laboratory): "The Technique and Applications of Polarised Infra-Red Spectrophotometry."

SATURDAY, JULY 9

Fourth Empire Mining and Metallurgical Congress

London and Oxford (until July 23): About 600 delegates and members representing 27 countries will attend. Headquarters: Grosvenor House, Park Lane, London, W.1.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the summary, but such total may have been reduced.)

Barclay-Stuart (Plastics), Ltd. (formerly Barclay Stuart Engineering Works, Ltd.), London, E.C. (M., 2/7/49.) May 25, £2500 charge, to English Estates Assurance, Ltd.; charged on 25 and 27 Brunswick Street, and factory and outbuildings in Duke Street, Luton. *Nil. December 30, 1948.

Lavis Services, Ltd., Heaton-with Oxcliffe. (M., 2/7/49.) May 23, mort., to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land with workshop at White Lund, Morecambe and Heysham, with fixtures, etc.

Lipton's Chemical Co., Ltd., London, W. (M., 2/7/49.) May 19, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on 16, 17 and 18 West Hampstead Mews, Hampstead, and fixtures. *Nil. December 31, 1944.

Oakes Eddon & Co., Ltd., Liverpool. (M., 2/7/49.) May 27, £260 mortgage to Pelican Property Co., Ltd.; charged on 99 Prescot Street, Liverpool. *Nil. Dec. 30, 1948.

Satisfaction

Freers Chemical Works, Ltd., Bishops Stortford. (M.S., 2/7/49.) Satisfaction May 25, of debs. reg. June 4, 1946.

Receivership

Baldwin Chemical Industries, Ltd., London Road, Harlow, Essex. (R. 2/7/49). Mr. D. D. Mathieson, of 103 Cannon Street, E.C.4, was appointed receiver and manager on May 18, 1949, under powers contained in debenture dated October 7, 1947.

Company News

Amber Chemical Industries, Ltd.

Group trading profits for the first year since its incorporation on January 1, 1948, amounted to £63,407. Net profit was £52,437. A final dividend of 15 per cent on ordinary shares is proposed.

Laporte Chemicals

Consolidated profit of the company and its subsidiaries for the year ended March 31, £495,633 (£350,936). Net profit £396,467 (£259,990). Proposed final ordinary dividend 12½ per cent (same).

Timothy Whites and Taylors

The consolidated profit and loss account for 53 weeks ended January 1, 1940, shows trading profits and sundry income £1,083,519 (£1,490,201), plus £100,000 (nil) release of provision against variation in purchase tax. Profit of the parent company was £331,867 (£377,213). A dividend of 32½ per cent (same) is recommended.

Chemical and Allied Stocks and Shares

The further heavy fall in British Funds has been reflected in other sections of markets, emphasising the widespread anxiety regarding economic affairs and fears of renewed drains on Britain's gold and dollar reserves. The position may be clarified by the latest talks on the question of convertibility of European currencies; but if a deadlock persists, the special conference of Commonwealth finance ministers may have to be awaited before any final decision is made.

Sir Stafford Cripps is apparently afraid that the sequel to convertibility of European currencies might be very heavy drains on the sterling area's gold reserves. Britain might then have to face more austerity resulting from reductions in the food and other imports that would become necessary in order to save dollars.

Absence of demand has been as much responsible for this decline as has selling. The biggest sufferers have been the nationalisation stocks, which on Monday showed losses ranging up to £2 10s. British Gas stock was heavily hit, particularly as over £18 million more of this stock has now been issued as compensation to stockholders in the old gas companies. Fears that the market price might fall further led to a good deal of selling of Gas stock, which has been one of the factors contributing to the heavy slump in British Funds, which later, showed a small rally, and this gave markets a better undertone.

Industrial shares have been affected by the general trend of markets and shares of chemical and kindred companies also lost ground, although on balance most falls were fairly moderate.

Prior to the current slide in gilt-edged prices, industrial shares had been marked down heavily in many cases; and to some extent the gilt-edged fall is a reaction to the trend in industrial shares during the past two months.

Imperial Chemical receded to 43s. 9d., Monsanto were 50s., Fisons 44s., Albright & Wilsons 28s. 9d., Bowmans Chemicals 4s. shares 7s., Amber Chemical 6s., while elsewhere, Glaxo Laboratories had been marked down from the £18 level to £16⅞ at the time of writing. Boots Drug, however, after declining, strengthened to 47s. in anticipation of the full results and annual meeting. United Molasses were down to 36s. 6d. and later 37s., with Turner & Newall 70s. 6d. after 69s. 6d. Levers were 44s. 1½d. and Lever N. V. 42s. 1½d. while British Match were weak, falling to 30s.

Among shares of companies with plastics and allied interests, De La Rue fell heavily to 24s. 4½d. but were later 25s. British Xylonite were 66s. 3d. with British Industrial Plastics 2s. shares at 4s. Elsewhere, British Glues and Chemicals have changed hands around 17s. 9d.

Although the market is expecting good results with the dividend maintained, the 4s. units of the Distillers Co. were back to 24s. 10½d. and Dunlop Rubber 60s. 9d. Borax Consolidated at 51s. were fairly steady among shares of companies with important American interests and dollar income from the United States.

In other directions, British Aluminium moved back to 42s. 6d., and awaiting the new issue terms, Ilford were 23s. 10½d. although this and other projected new issues may, of course, be postponed until market conditions are less perplexing.

British Drug Houses 5s. shares were 6s 6d. and Beechams deferrred eased further to 11s. 3d. Iron and Steels were again lower and those scheduled for nationalisation moved further below their official "take-over" levels. Dorman Long were 27s. 6d., United Steel 25s. 3d. and Stewarts & Lloyds 53s. Oils were no exception to the general trend. Anglo Iranian being £7 and Shell 58s. 9d.

British Chemical Prices

Market Reports

ALTHOUGH trading conditions cannot be described as brisk, the general movement on the industrial chemicals market this week has been steady with the usual flow of routine buying orders. Delivery specifications, particularly for the textile industry, have been on a good scale and the volume of inquiry for export continues to be satisfactory. There is a good outlet for both solid and liquid caustic soda, sodium sulphide and bichromate of soda. The demand for chlorate of soda continues to be in excess of available supplies. There is little change among the potash products which remain firm. At the time of this report no price changes had been reported for acetic anhydride or acetone and business is quiet with lower quotations expected. A good demand is reported for the red and white leads at the recently reduced quotations and rather more inquiry has been reported for the copper compounds. A number of items which have been on the exemption list will now become chargeable with Key Industry Duty as from July 1. These include oxalic acid, methylene chloride and urea. The revised list of exemptions are published under S.I. 1158. A quiet trade is reported from the coal tar products market and apart from contract deliveries movement has been of small dimensions. Pitch is a possible exception and is in good request both for home and export.

MANCHESTER.—In the home section of the trade holiday conditions continue to affect the movement of supplies on the Manchester chemical market to the textile mills and other industrial consumers, but apart from this seasonal influence the demand during the past week has been described as reasonably satisfactory, with the general run of alkali products, as well as the potash and magnesia compounds and a wide range of other chemicals being called for in steady quantities. There has been a fair amount of inquiry also on export account. In the fertiliser market business is seasonally quiet in most sections, while taking the tar products market as a whole the demand has been only moderately active.

GLASGOW.—Conditions generally in the Scottish chemical market have not been quite so active. Certain types of business are now very quiet and this is being reflected in a slackening of demand for chemicals. This particularly applies to chemicals used by the paper trade. On the other hand, with more and more new factories being opened in Scotland, a few of which are large chemical buyers, the general volume of business is being maintained. There have been no particular demands of outstanding character and the supply position is fairly satisfactory. The export market has been a little more active than usual.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Handling of plastic sheets and apparatus for use in moving material in sheet form—Turners Asbestos Cement Co., Ltd., and W. H. Rooksby. June 8, 1945. 621,111.

Plants for the treatment of asbestos-cement or like sheets in the plastic state.—Turner Asbestos Cement Co., Ltd., and W. H. Rooksby. June 8, 1945. 621,113

Iron chromium-manganese alloys.—Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. June 9, 1942. 621,116.

Alkylene cyanohydrins.—A. H. Stevens. (American Cyanamid Co.) Aug. 3, 1945. 621,117.

Amino acids.—Winthrop Chemical Co., Inc. Dec. 19, 1944. 621,477.

Rotary fluid meter.—A. R. J. Ramsey (R. N. Brodie Co.) Dec. 21, 1945. 621,205

Decarburisation of iron or iron alloy castings.—Birlec, Ltd., and P. F. Hancock. Jan. 23, 1946. 621,496.

Process for the production of esters of mono-methylene-ethers of 2 ketone-1-gulonic acid.—Chemische Fabriek Naarden. Aug 3, 1943. 621,209.

Apparatus for the storage and distribution of carbon-bisulphide and other liquids.—D. Bywater. March 21, 1946. 621,127.

Processes of treating starch and dextrin and the products resulting therefrom.—Corn Products Refining Co. July 18, 1945. 621,128.

Synthetic bonding agent.—Stidvigs & Halsingborgs Limfabrieker A/B. March 29, 1946. 621,129, 621,130.

Extrusion of strips or ribbons from thermoplastic materials.—S.P.A. Lavorazione Materie Plastiche. March 28, 1945. 621,211.

Process for recovering an ascorbic acid compound. Merck & Co., Inc. June 15, 1945. 621,392.

Plants for the treatment of asbestos-cement or like sheets in the plastic state.—Turners Asbestos Cement Co., Ltd., and W. H. Rooksby. June 8, 1945. 621,135, 621,136.

Copper-tin alloy plating.—Metal & Thermit Corporation. Jan. 5, 1946. 621,217.

Control of the rate of flow of fluids.—R. H. Froude. Aug. 12, 1946. 621,395

Working and heat-treating beryllium-copper alloys.—J. G. Gaunt. (Beryllium Corporation.) Aug. 23, 1946. 621,224.

Purification of sugar solutions.—American Cyanamid Co. Nov. 17, 1945. 621,225.

Process for the gasification of carbonaceous materials and for the manufacture of water gas therefrom.—C. Arnold. (Standard Oil Development Co.) Sept. 10, 1946 621,512.

Recovery of riboflavin.—Merck & Co., Inc. Oct. 31, 1945. 621,481.

Process and apparatus for the operation of gas producers.—O. A. Ohlsson. Aug. 8, 1946. 621,517.

Production of sulphuric acid or oleum.—I.C.I., Ltd., F. A. F. Crawford, and J. Bell. Oct. 9, 1946. 621,158.

Stabilisation of edible oils and fats.—Universal Oil Products Co. Oct. 24, 1945 621,519.

Manufacture of carboxylic acids.—W. H. Groombridge Oct. 16, 1946. 621,520.

Synthetic resin adhesives.—I.C.I., Ltd., E. J. G. Balley, and J. M. J. De M. Estevez. Oct. 18, 1946. 621,165.

Firegrates or furnaces for burning solid fuels.—C. F. Wade. Nov. 2, 1946. 621,521.

Manufacture of long chain alkyl-substituted aromatic hydrocarbons.—E. I. Du Pont de Nemours & Co. Nov. 28, 1945. 621,179.

Manufacture of chlorinated aliphatic acids.—A. R. Hammond, J. A. John, and R. Page. Jan. 13, 1947. 621,531.

Manufacture of tertiary carbinols.—Roche Products, Ltd., A. L. Morrison, and H. Rinderknecht. Jan. 17, 1947. 621,231.

Manufacture of aqueous emulsions.—I.C.I., Ltd., A. J. Watters, and D. M. Shepherd. Jan. 17, 1947. 621,188.

Purification of β-ionone.—L. E. Jones. (Distillation Products, Inc.) Feb. 1, 1947. 621,412.

Manufacture of symmetrical dichlormethyl tetramethyldisiloxane.—Corning Glass Works. Feb. 13, 1946. 621,243.

Coating of surfaces.—Schori Metallising Process, Ltd., and W. D. Jones. Feb. 10, 1947. 621,244.

Manufacture of sulphonamides.—British Celanese, Ltd. Feb. 14, 1946. 621,284.

Inoculants for cast iron.—Mond Nickel Co., Ltd. March 15, 1946. 621,260.

Preparation of sulphonamide derivatives.—Wellcome Foundation, Ltd., B. C. Platt, and T. M. Sharp. Feb. 13, 1947. 621,289.

Casting metal.—New Jersey Zinc Co. June 25, 1946. 621,269.

Manufacture of 1-phenyl-2-dimethylamino-methylcyclohexan-1-ol.—I.C.I., Ltd., J. A. Hendry, and W. S. Waring. Feb. 14, 1947. 621,292.

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Photo: Courtesy Imperial Chemical Industries Ltd., Billingham

Manufacture of varnish resin interpolymers.—Dow Chemical Co. Feb. 23, 1946. 621,542.

Holders for electrodes of carbon or other material adapted for use in electric arc welding.—R. A. Copeland. Feb. 17, 1947. 621,314.

Manufacture of semi-esters of dicarboxylic acids.—Ciba, Ltd. Feb. 17, 1946. 621,324.

Electrolytic cells.—I.C.I., Ltd. Feb. 18, 1946. 621,550

Aluminium base alloys.—I.C.I., Ltd., R. Chadwick, and G. H. Blenkarn. Feb. 19, 1947. 621,336

High temperature alloys.—British-Thomson-Houston Co., Ltd. (General Electric Co.) Feb. 21, 1947. 621,361.

Production of alkali-resistant alginate materials.—Alginate Industries, Ltd., J. B. Speakman, N. H. Chamberlain, and C. M. C. Dorkin. Feb. 21, 1947. 621,262.

Production of the ammonium salts of penicillin.—Distillers Co., Ltd., P. Eaglesfield, and H. Tozer. Feb. 25, 1947. 621,434.

Manufacture of synthetic oestrogenic agents.—British Schering Research Laboratories, Ltd., D. H. Hey, P. R. Carter, W. H. Hook, and M. E. H. Fitzgerald. Oct. 26, 1944. 621,460

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.*

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SITUATION VACANT

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Coal—Or Chemicals?

WHOEVER exercises monopoly control of the coal resources of the country holds in his hand one of the prime essentials for the maintenance of an active chemical industry. That is a truism which in the past has caused little concern because the functions of the closely integrated partnership between coal and its highly elaborated array of chemical products were clearly defined and the partners were content to remain as specialists each in his own department. That state of affairs had been attended with all the evidences of prosperity for more than a generation prior to the profound changes brought about in the deparment of coal raising by the nationalisation of the mines. The raw material was forthcoming in sufficiently regular and ample quantities to enable the chemical partners to build up in security great industries for the extremely varied distillation products, which have conferred great benefits on a host of subsidiary industries—tar and surface coatings, pharmaceuticals, dyestuffs, some textiles, fertilisers and others as far ranging and as profitable in the home and export trade.

For the moment, that imposing structure in which so large a part of the country's heavy industries are still contained, looks very much as it did before war and later the nationalisation of the mines robbed the system of some of its security. The quantity and quality of coal supplies have conspicuously deteriorated, but there have been good reasons to expect that the worst phase of this lowered efficiency was passed. The gradual approach to more efficient coal getting was the theme of much of the recent annual report of the National Coal Board, which is faced, however, with disconcerting evidence that coal raising alone can still barely cover the very high production costs. And, like all nationalised industries, the NCB will have no compunction in ousting any of the former partners of the coal-chemical alliance if there are substantial profits to be had by doing so.

All these factors are now being called to mind in connection with one of the subsidiary, but evidently significant, themes of the recent NCB report. That recalled, for example, that the board's coke ovens, enjoying top priority in coal supplies, were able to increase very largely their coke and gas production. It follows that there was a corresponding increase in by-products, which the board found are readily saleable. The board did not miss the significance of this possibility of balancing some of its much less profitable activities. "At present the board's by-product plants distil only a

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quarter of the crude tar they produce, the remainder being sent to private distillers under contracts inherited from colliery companies," says the report. "The board propose in future to distil more of their tar themselves where this can be done efficiently and profitably. They therefore gave notice during the year to end a number of contracts with distillers. These contracts covered nearly a quarter of the board's output of tar."

That policy statement reflects one of the least attractive proclivities of a nationalised corporation, which will unhesitatingly make incidental monopolies of its own by-products regardless of the damage that may inflict on flourishing industries which its predecessors served. It is in effect the backstairs route to furtherance of State control without the substantial compensation the older method demands. Working up of by-products in the manner mentioned in the board's report is only the first step. It may well be that intermediate products and finally finished products will be added as the years go by. Since the NCB and the Area Gas Boards have control of by far the largest share of coal by-products it would be difficult to say where this might end.

The NCB is already the biggest individual producer of motor benzol in the country. Its output in 1948 was about 12½ million gallons. Nearly all this was marketed through the National Benzole Company of which the board is a member. Benzol fractions such as pure benzol, toluole, xylole and naphtha were supplied to the dye, lacquer, paint and varnish trades. They were also supplied for use as solvents, waterproofing agents, textile finishes and as raw material for the production of resin and for other chemical processes. Creosote oil was supplied to Imperial Chemical Industries for the production of petrol by hydrogenation and the 66,750 tons of sulphate of ammonia distributed through the Sulphate of Ammonia Federation was a good deal less than the market would readily have taken.

This gratifying evidence of the saleability of things other than coal, is evidently offering to the NCB the strongest temptation to ease its unstable finances at the expense of more competent departments of industry and of its own primary function.

Notes and Comments

Pioneer Work

MOST of the exhibits shown last week at the Chemical Research Laboratory were indicative of a steady continuation of important basic work of the kind that ultimately lies behind all striking new discoveries. Whereas the first post-war exhibitions put on view the discoveries of an eight-year period, the annual shows have necessarily less ground to cover and show a correspondingly smaller element of innovation. In the extraction and examination of low-melting gallium, however, this country is entirely a pioneer. The extraordinary anisotrophic properties of this metal are now being recognised, and it is evidently of great importance now that due thought should be applied to the problems of application and of large-scale extraction. After unfortunate experience in the past, such as that associated with large-scale penicillin production, it would be inexcusable if fundamental advances such as this were not fully developed here. It needs to be repeated that the work of our scientists, including those at the Chemical Research Laboratory, is potentially valuable export, yielding a maximum return for a minimum of "material."

CRL and NPL

THE recent report of the Chemistry Research Board for 1947 and the opportunity of seeing some of the work described during the "open day" last week at the Chemical Research Laboratory also confirm the impression that research of a very high quality continues at Teddington. One of its most practical aspects has been the work on corrosion under the gifted direction of Dr. W. H. D. Vernon—in which the effective use of sodium benzoate as a corrosion inhibitor incidentally recalls how commonly current conditions favour the short-term policy in research. Some of these conclusions might very well lead to the solving of much wider and more fundamental problems. While the quality of the work at the CRL is undoubted, it is not easy entirely to dismiss the impression that the scale of operations at the neighbouring National Physical Laboratory has more closely matched the vigour of the British chemical industry. There are many likely explanations, including the probable answer that the industry prefers as a rule to solve its own problems rather than pass them on to a central agency. Yet there are functions better undertaken by the group organisation. A notable example, from the NPL, has been the work of its Metrology Division in maintaining standards of chemical purity. Chemical industry does not lack fundamental problems of great importance, the solution of which is certainly beyond the power of smaller industrial units. These cannot support their own research and their requirements are too diverse to be satisfied by existing group facilities. Clearly the time is ripe for a major expansion of the CRL.

Fermentation and Solvents

FERMENTATION, one of the most potent and productive procedures in chemical industry, old in its uses long before chemistry had any recognisable form, is commanding new attention because of two impending events, one of which is in a sense a rival of the fermentation method of solvents production. That is the forthcoming opening at Stanlow, in Cheshire, of the £4 million plant with which Shell Chemicals, Ltd., will provide the first example in this country of the bulk production of commercial solvents as derivatives of petroleum (pages 45-47, this issue). The notion that this enterprise, large as it is in its initial scope and full of promise for the future, is in any sense a rival of traditional fermentation methods is, of course, an illusion. If it serves even as a large supplementary source of industrial solvents, in addition to all the other chemicals which are to come from this elaborate installation, it will still present no danger of oversupplying current needs. Some idea of the versatility of the fermentation principle is conveyed in the programme produced for the Royal Institute of Chemistry symposium being held at St. Andrews during July 23 and 30: "Recent Advances in the Fermentation Industries." The many original studies being presented there by acknowledged experts of aspects of industrial fermentation call to mind the vast scope of the field which was opened by the perception of such workers in different periods as Pasteur, Weizmann, Wehmer and Rose, and leave no doubt that such achievements as the first production of penicillin did not necessarily represent the climax of this dramatic theme.

Fume Legislation

THE need to enlarge the comparatively elaborate machinery which has been built up in piecemeal fashion to ensure that chemical and associated industries do not dangerously pollute the atmosphere is recognised in a notification from the Ministry of Health this week. This makes it clear that there is a firm intention to introduce fairly quickly new legislation which will impose fresh responsibilities upon both the chief inspectors under the multifarious Alkali, etc., Works Regulation Act, 1906, and its various additions and upon industries capable of producing volatile emissions of organic sulphur compounds or the fumes associated with carbon black production and fluorine. The need for precautions against pollution from the latter two arises from the fact that the first, in its American form, is a new industry here and the destructive effects of the second were established by disconcerting evidence produced early this year by the Medical Research Council committee which studied the effects in Scotland of fluorine released during the electrolytic reduction of aluminium. Fluorine, which has lately been the subject of some painstaking investigation in the U.S.A. (THE CHEMICAL AGE, *60*, 882) was shown to have a very damaging effect on herbage and on sheep and cattle in the vicinity. It has to be borne in mind, however, that fluorine emission is by no means confined to the aluminium process. In varying degrees, it is contained in the fumes of many installations of much wider distribution—brick kilns, for example.

Carbon Black and Fluorine

THE changes intended by the Ministry of Health are in fact rather wider than the foregoing would suggest. A draft order has already been prepared which proposes, in addition to listing volatile organic sulphur compounds, carbon black fumes and fluorine as "noxious and offensive gases," would make carbon black plants, "fluorine works" and acid sludge works subject to registration. Several more processes associated with sulphuric acid production, bisulphite and cement would also come within the province of the Alkali Works legislation. It is satisfactory to observe, in view of the far-reaching effect of such additions to legislation as these, that the whole subject is to be examined at a public inquiry before the present order is confirmed and that individual firms, as well as associations, have the opportunity of making their views known to the Ministry beforehand. Such views must be presented before July 23 and in consideration of the large addition to equipment costs which the order may involve, this is clearly one of those contexts in which the facts from the industrialists' point of view should be adequately presented. While the desirability that all chemical processes should operate with the least possible damage to health and the countryside is to-day fully recognised in all responsible quarters, the end is not to be procured by any legislation passed without full acquaintance with the facts. It is not sufficiently widely known, for example, that even now some costly schemes for reducing emission of fume, gas or solids are held up by such factors as the shortage of plant and steel and the difficulties to-day of erecting large chimney stacks.

FURTHER FALLS IN MATERIAL PRICES

Vegetable Oils, Lactic Casein and Solvents

FURTHER reductions announced by the Ministry of Food last week end effect economies of £12 per ton in the official prices of the two common grades of unrefined linseed oil and of unrefined castor oil. This, the second reduction of controlled prices of these oils, brings the cumulative saving to users since the beginning of May to £32 per ton.

The new price schedule, which is for the 5-week period ending August 6, is as follows (per ton, naked, *ex*-works):—

UNREFINED: Linseed oil, from £150 to £138 per ton naked ex works; linseed oil foots, from £100 to £88 per ton naked ex works; castor oil crude firsts, from £122 to £110 per ton naked ex works; castor oil crude seconds, £115 to £103 per ton naked ex works.

The prices of all other unrefined oils and fats, and technical animal fats allocated to primary wholesalers and large trade users in the period will remain unchanged.

* * *

IN consequence of the recent fall in the prices of ethyl and butyl alcohols, British Industrial Solvents, Ltd., has announced price reductions for a large number of the solvents, plasticisers and intermediates derived from these materials. On July 1 and thereafter the following reductions will operate:—

Aldol	£11 per ton
Butyl lactate	£17 ,,
Butyl oleate	£4 ,,
Butyl phenol	£19 ,,
Butyl stearate	£15 ,,
Butyraldehyde	£14 ,
Crotonaldehyde	£14
Dibutyl oxalate	£16 ,,
Dibutyl phthalate	2¾d. per lb.
Dibutyl tartrate	£74 per ton
Diethyl oxalate	£6 ,,
Diethyl phthalate	½d. per lb.
Diethyl tartrate	£11 per ton
Dimethylacetal	£6 ,,
Ethyl hexanol	£16 ,,
Ethyl oleate	£1 ,,
Methyl acetate	£5 ,,
Paraldehyde, technical	£16 ,,
Paraldehyde, stabilised	£16 ,,
Tetrahydrofurfuryl acetate	£42 ,,
Tetrahydrofurfuryl stearate	£65 ,,
Tributyl citrate	£16 ,,

* * *

THE Board of Trade has announced that the price of lactic casein distributed through the agency of the Lactic Casein Importers' Association, Ltd., 23 St. Swithin's Lane, London, E.C.4, has been reduced by £22 10s. per ton, as from July 1.

The revised schedule of prices, which are net, *ex*-warehouse, is as follows:—

	1 ton and over per metric ton	Less than 1 ton per metric ton
30/60 mesh	£120	£125
90 ,,	£125	£130
Soluble	£130	£135

Less than 1 bag, 3s. per kg.

Society of Chemical Industry

THE 68th annual assembly of the Society of Chemical Industry will be held in Manchester, beginning on Monday next. A comprehensive programme for the five days has been arranged including lectures, works visits, social and other activities.

Proceedings open on the evening of July 11, with a reception by Sir David Rivett, the president, at the Whitworth Hall, University of Manchester.

The annual general meeting follows at 10 a.m. on July 12, when the presidential address will be given. This will be followed by a luncheon at 12.30 p.m., at the Midland Hotel, by invitation of the Manchester section.

In the evening there will be a reception by the Lord Mayor of Manchester in the Town Hall.

The annual dinner will be held at 7.30 p.m., at the Midland Hotel, on Wednesday, July 13.

Included in an interesting programme are visits to the works of Courtaulds, Fibreglass, I.C.I., the Manchester Oil Refinery, and Petrochemicals.

Record Plastics Exports

The plastics industry was complimented on its export performance by Mr. Harold Wilson (President of the Board of Trade) speaking at the luncheon in London recently of the Plastics Institute. The export in 1948 of 19,300 tons of plastics was 5½ times as large as the total exported in 1938, he said. Australia and India were our best markets, but no less than 12 per cent of all exports went to hard currency areas.

NON-FERROUS METAL STATISTICS

MAY figures for production, consumption and stocks of non-ferrous metals in the United Kingdom, show a general increase in stocks above the April totals, although consumption was greater in May than in the previous month.

Unalloyed copper and alloyed copper products in May reflected an increase of 5238 long tons on the April output.

An abstract of the monthly figures supplied by the British Bureau of Non-Ferrous Metal Statistics is given in the accompanying tables.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	37,344	78,009
Imports	10,754	14,001
PRODUCTION:		
Primary	—	8,760
Secondary	3,388*	6,629
CONSUMPTION:		
Primary	8,799	23,269
Secondary	—	18,980
Exports	2,360†	12
CLOSING STOCKS:		
Govt. and consumers'	38,209	79,282

* Rough copper.

† Includes 904 tons rough copper dispatched to Belgium and 1456 tons of rough copper to Germany, for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	25,938	long tons
Alloyed copper products	22,862	,, ,,
Copper sulphate	4,093	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	14,723	50,580
Imports	1,798	18,147
PRODUCTION:		
Virgin and remelted ...	—	4,986
CONSUMPTION:		
Virgin (incl. debased)	5,866	14,330
Remelted and scrap ...	—	8,109*
Exports	—	49
CLOSING STOCKS:		
Govt. and consumers'	10,655	60,741

* Includes small quantity or zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Other than Govt. and consumers'	54	32,147*	793*	–
Imports	—	19,755	– –	33
PRODUCTION: ...	191	—	2,325	—
CONSUMPTION: . .	197	11,505	3,008	12,571
Exports	–	49	—	—
CLOSING STOCKS				
Other than Govt. and consumers'	48	43,160*	3,500*†	–

* Govt. and consumers'.

† Includes adjustments not previously reported.

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	14,843
IMPORTS	208
PRODUCTION	3,125
CONSUMPTION	1,614
EXPORTS AND RE-EXPORTS	108

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	392
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	289

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	39.15

Refinery Alcohol

THE importance of the new source of industrial alcohol represented by the Shell Chemical Corporation at Deer Park, Houston, Texas, was emphasised by the president of the Shell Oil Co. of Canada, Ltd., Mr. W. M. V. Ash, speaking in Montreal recently. The plant accounting for $12 million of the $54 million allocated by the Corporation for development would produce annually from the ethylene of a nearby refinery the equivalent in ethyl alcohol of what could be produced by 45 million bushels of grain. The relatively direct conversion would be very much cheaper than the fermentation of molasses and beet sugar, which was the source of most ethyl alcohol in the past.

ECA Chemicals

AN Economic Cooperation Administration report showing the totals by commodities of procurement authorisations granted all European countries under the Marshall Plan from the beginning of the programme, April 3, 1948, to June 1, 1949, reveals that $145.7 million have been allocated for chemicals and related products. The principal chemical authorisations were these (in $ million): Medicinal and pharmaceutical preparations, $28.4; industrial chemicals, except alcohol, $18.8; alcohol, $13.2; pesticides, $1.5; other, $83.3. Earmarked for other supplies were: Nitrogenous fertiliser, $21.4; other fertiliser, $14.7; copper, $157.7; aluminium, $63.8; zinc, $55.1.

UTILISATION OF NUCLEAR ENERGY

Problems for Chemical Engineers

THE lack of special instruments and the effects of radiation on materials used in nuclear physics are raising a host of fundamental problems for instrument makers and chemical engineers. Upon their successful solution depends to a large degree the further development of nuclear physics in industry. Inadequate development of instruments for use in areas of intense radiation and high temperature threatened to limit the operation of the first atomic power plant.

This was the view expressed by David Cochran and C. A. Hansen, Jr., engineers of the General Electric Co., at the Knolls Atomic Power Laboratory, Schenectady, New York, when they addressed the semi-annual meeting of the American Society of Mechanical Engineers, San Francisco, California, at the end of June.

Lack of instrument testing facilities was the biggest obstacle to the development of instruments for operating and maintaining an atomic power plant. Only a few places existed in the United States, they pointed out, where the effect of radiation on materials and devices could be studied or where liquid metal cooling systems were available for instrument testing. Nowhere, they added, was there the combination of radiation and extremely high temperature such as would exist in an atomic power plant.

So far, they said, there were no demonstrated solutions to the unusual instrument problems presented by nuclear energy, but more and better testing facilities were now being built.

Instruments were needed in the plant for control and safety of plant operation; for observing the condition and behaviour of the plant as its operation proceeded; and for monitoring radiation leakage for the protection of operating personnel.

Vital Characteristics

Essential requirements included extreme dependability, remote maintenance, resistance to neutron and gamma radiation, absolute leak tightness and long service.

Maintenance by remote control was necessary, as it was not possible to perform direct inspection and maintenance work on the detecting devices within the radioactive zone. When a failure occurred it might be necessary to remove and replace the instrument by means of remotely operated equipment.

If a device had become radioactive in service it could not usually be repaired after removal, but had to be replaced with a new unit. Where the detecting elements were very difficult to remove or were completely inaccessible, it would be necessary to install stand-by detecting elements when the plant was built.

Resistance to radiation was vital because pressure, temperature and flow detectors must function correctly in the presence of tremendous radiation. Continued exposure to radiation must not cause such physical deterioration of the device likely to change its performance in any way that could not be determined and compensated for. Also, devices to detect chemical contamination of the coolant must function in spite of the radioactivity of the coolant.

Gas Leakage Danger

Detecting elements exposed to the coolant or blanket gas must be absolutely leak-proof, because the escape of even minute quantities or radioactive coolant might cause a serious hazard. Similarly, if the blanket gas contained any gaseous fission products or radioactive dust particles, the leakage of gas might be dangerous.

Because of the extreme difficulty and expense of replacing faulty detecting elements, long operating life was much more important in these applications than was usually the case, they continued. There was great incentive to develop long-lived devices, and ample justification for employment of more expensive methods to insure long service. It was certainly to be hoped that instrument failures would not become the cause for shutting down the plant.

Before the address by the G.E.C. engineers, the whole problem of adapting nuclear energy as a source of power was surveyed by Glenn T. Seaborg, the eminent American scientist, who is a member of the General Advisory Committee to the U.S. Atomic Energy Commission and professor of chemistry at the University of California. He was also a co-discoverer of a number of fissionable isotopes.

Problems that must be solved before atomic energy could be made useful were largely engineering, Mr. Seaborg said. Machines must run at high temperatures in order to extract the energy in useful form, he explained, and this meant that there would be problems involving materials of construction. Such materials would also have to be chosen from those whose neutron absorption was small and this limited the choice to uncommon substances.

EXPLOITING RESEARCH

Wide Powers of Development Body

THE names of the chairman and members of the National Research Development Corporation were announced in the House of Commons last week.

Replying to a question by Mr. A. R. Blackburn, the President of the Board of Trade recalled that Sir Percy Mills had accepted his invitation to become chairman. The five other directors appointed were: Prof. P. M. S. Blackett (Manchester University); Sir John Duncanson (steel); Sir Edward Hodgson (Board of Trade); Mr. W. E. P. Johnson (Power Jets Corporation); and Sir Edward de Stein (formerly Ministry of Supply).

Lord Halsbury's appointment as managing director had been announced in May, said Mr. Wilson (THE CHEMICAL AGE, 60, 712), and the corporation accordingly came into existence on June 28.

To Exploit Inventions

The functions of the corporation are defined in the Development of Inventions Act, 1948, under which the corporation was set up, as follows:—

(a) of securing, where the public interest so requires, the development or exploitation of inventions resulting from public research, and of any other invention as to which it appears to the corporation that it is not being developed or exploited or sufficiently developed or exploited;

(b) of acquiring, holding, disposing of and granting rights (whether gratuitously or for consideration) in connection with inventions resulting from public research and, where the public interest so requires, in connection with inventions resulting from other sources.

The expression "invention" includes any new process or new technique and the Act will construe it without regard to whether or not a patent has been or could be granted. "Public research" means research carried out by a Government department or other public body or any other research in respect of which financial assistance is provided out of public funds. The corporation is thus empowered to develop and exploit inventions over which the Government has the right of proprietor (e.g. inventions in the possession of Government departments), and also inventions emanating from private sources which are likely to be of benefit to the community and are not being adequately used already.

The corporation, which may borrow up to £5 million from the Treasury within five years, has yet to appoint its staff.

FUEL GAS RECOVERY

Practical Use of Natural Methane

ONE of the most interesting developments at the Mogden sewage works of the Middlesex County Council, recently visited by members of the London and South-Eastern Counties Section of the Royal Institute of Chemistry, was the gas recovery associated with the aeration tanks.

Here the visitors saw how the settled sewage was aerated with activated sludge which, after a final settlement, was clear and fit to pass into the river.

The sludge, which is separated during the purification process, is digested at 80°F. and methane is generated.

After viewing the digestion tanks and gas holders where the methane is stored, the party proceeded to the compressor rooms where the gas is compressed to 5000 p.s.i. It is bottled, at 3000 p.s.i. and used to drive vehicles. The residue is used to drive pumping engines, and generally provide heat and power throughout the works.

A film "Taken for Granted" which gave a general outline of the various processes was shown before the tour of the works.

CHEMICAL EMPLOYMENT

THE numbers employed in the chemical and allied trades in Great Britain in April remained steady, showing little deviation from the previous month.

Figures published in the current issue of the *Ministry of Labour Gazette* show sectional distribution as follows:—

Industry	Thousands April, 1949	 March, 1949	 Mid 1948
Coke ovens and by-product works	17.7	17.6	17.3
Chemicals and dyes	196.7	196.8	195.5
Pharmaceutical preparations, etc.	31.7	31.7	30.8
Explosives and fireworks ...	36.5	36.8	33.8
Paint and varnish	37.3	37.2	37.0
Soap, candles, glycerine, etc. ...	47.7	37.9	46.9
Mineral oil refining	33.8	33.8	30.7
Other oils, greases, glue. etc. ...	30.2	30.2	28.9
Total, chemical and allied trades	431.6	432.0	420.9

"Good Welding Technique"

In the report of a new U.S. procedure for welding 4-6 chrome pipe (THE CHEMICAL AGE, 60, 678), it was stated that a large preheating tip with oxyacetlyene was used first to bring the temperature of the joint up to 600-800°C. and maintain it while the welding was done. The temperature was then raised to 1200-1350°C.

Both these temperatures should have been given as Fahrenheit.

Shell's New Petroleum Chemicals

Stanlow Will Increase Bulk and Variety

THE impending opening at Stanlow of the newest Shell plant to produce chemicals from petroleum is the subject of a full explanatory statement by Shell Chemicals, Ltd., accompanied by an excellently produced book in which nearly every aspect of the Stanlow enterprise, technical and otherwise, is ably described and illustrated.

The current statement recalls that hitherto most of Britain's organic chemicals have been manufactured either from indigenous coal by distillation or from imported molasses or other carbohydrates by fermentation processes. The supply has been augmented by direct imports of finished products, natural and synthetic, from hard currency areas, including products of the U.S. petroleum chemical industry, which have stimulated keen interest here.

A considerable market for ketonic and alcoholic solvents, extractants and intermediates was thus built up in Britain, based on the earlier development in America of the highly reactive olefins obtained when petroleum is cracked. It was soon appreciated that the establishment of a similar industry within the sterling area, would not only satisfy the increasing demands for such chemicals, but would also save imports, either of raw materials or finished products, from hard currency areas—particularly if related to future refinery operations which would provide appropriate feedstocks from normal refining processes.

The need for a petroleum-based chemical industry in the U.K., therefore, has been fully recognised and there are several plants now nearing completion. One of the first to come on stream is the Shell plant at Stanlow.

Early Experience

The Shell organisation enjoys the advantage of having pioneered similar developments in the U.S.A. The earliest of these were the Martinez plants built by Shell Chemical Corporation for the manufacture of secondary butyl alcohol (1930) and methyl ethyl ketone (1933) from butylene, and of isopropyl alcohol from propylene (1935). These were followed in 1936 by another plant at Dominguez, near Los Angeles, for the further manufacture of isopropyl alcohol and acetone and the many derivatives.

The adoption of continuous operation which characterises the Shell Chemical

[Shell Photographic Unit

The large cracking unit and the converters at Stanlow and, in the background, the cooling tower

Corporation plants meant that entirely new types of plant had to be designed to function at the critical operating conditions frequently encountered. All the accumulated experience of the group is embodied in the design of the new units at Stanlow. Their situation near the Thornton research centre will facilitate continuous study of the varied technical problems involved in developing new chemicals and in utilising them to the best advantage in many derivatives.

The plant consists essentially of a thermal "cracker," with units specially designed to deal with the " cracked " products by fractionation, hydrogenation and polymerisation, synthesis and distillation, as well as a number of reactors and convertors. Continuous operation and highly centralised and automatic control are expected to render the productivity per worker the highest in any industry in Britain.

Low Pressure Process

The basic raw material for the plant is gas oil, cracked under carefully controlled conditions of high temperature and low pressure to give a high yield of hydrocarbons containing 3 and 4 carbon atoms These fractions include a very high proportion of the olefins, propylene (C_3 stream) and butylene (C_4 stream) which, when separated, form the feedstocks for the manufacture of the solvents and other chemicals now being produced.

The new Stanlow refinery, at present under construction alongside the existing plants is designed to refine 2½ million tons a year of crude oil from non-dollar sources and will, when complete, provide these feedstocks without the necessity for special cracking. Complete integration of refining operations and chemical manufacture as achieved already in America, will thus be possible.

The C_3 fraction contains propane and propylene only. It is allowed to react with sulphuric acid in which the propylene is absorbed, forming alkyl esters, while the unattacked propane is separated and used as fuel. The alkyl esters are hydrolysed with water for the production of isopropyl alcohol, which is separated from the acid by stripping with steam and then purified by distillation.

Alcohols

In addition to butane, normal butylene, and isobutylene, the C_4 fraction contains other products which are removed from it by special chemical treatment. The mixture is then extracted with cold sulphuric acid of moderate strength which absorbs the isobutylene but does not touch the normal butylene or butane. Treatment with acid in the manner employed for the production of isopropyl alcohol then leads to the formation of alkyl sulphates from which secondary butyl alcohol is obtained by hydrolysis and distillation.

By heating to high temperatures under carefully controlled conditions and in specially designed equipment, the alcohols can be dehydrogenated to give the corresponding ketones, together with hydrogen in a high state of purity suitable for hydrogenation reactions. Isopropyl alcohol, on dehydrogenation, yields acetone and secondary butyl alcohol yields methyl ethyl ketone; both these products are also purified by distillation processes.

Under suitable conditions, acetone may be converted into diacetone alcohol which, in its turn, can be converted into methyl isobutyl ketone via mesityl oxide. All these products are purified by distillation.

Shell chemical engineers have brought the complicated and difficult processes of separation and distilliation to a very high degree of perfection. This makes possible the production of solvents of minimum 99 per cent purity, whose marketing specifications are those of essentially pure organic chemicals.

The range of solvents at present being produced at Stanlow is:—

From propylene (from the C_3 stream): Isopropyl alcohol, isopropyl ether, acetone, diacetone alcohol, metsityl oxide, methyl isobutyl ketone.

From butylene (from the C_4 stream): Secondary butyl alcohol, methyl ethyl ketone.

These products can be divided into three types—ketones, alcohols and ethers. Each has many industrial uses.

Many Solvents

Acetone is a low boiling ketone and a very powerful solvent which is widely used in industry. Its uses as a solvent include the manufacture of nitrocellulose lacquers, aeroplane dopes, paint removers, transparent paper, photographic film, celluloid, leathercloth, acetate rayon and explosives. It is employed in the extraction of many drugs and pharmaceutical products. As a raw material it is used for the manufacture of chloroform, synthetic perfumes and plastics, including methyl methacrylate.

Methyl ethyl ketone is very similar in solvent power to acetone, but has the advantage of being less volatile and therefore more easily handled. It is also a good extractant and is a useful raw material for chemical synthesis, being used in the manufacture of synthetic perfumes, rubber accelerators and ketone/formaldehyde resins.

Methyl isobutyl ketone is a medium boiling ketone, and, like acetone and methyl ethyl ketone, possesses good solvent powers for surface coating applications and for extraction processes, besides being valuable as a chemical intermediate. It can be used for the purification of penicillin.

One of the most important industrial uses for diacetone alcohols is in the manufacture of hydraulic brake fluids. It is one of the few organic materials which offer complete miscibility with castor oil at high and low temperatures, a low freezing point and non-corrosive action, and it has the minimum effect on the rubber parts of the brake mechanism. It is also a useful high boiling solvent for use in finishes such as nitrocellulose and cellulose acetate lacquers. Being completely miscible with water, it is also of interest as a solvent for dyestuffs.

For Food Industries

Of the alcohols, isopropyl alcohol, besides being used as a latent solvent for lacquers, is employed for many extraction purposes, such as the manufacture of flavouring essences from fruit and other natural products. It is useful in the food processing industry as a dehydrating agent for starch and gelatine and as a precipitant in the extraction of pectin from citrus fruit.

Besides being a useful solvent in the surface coating industries, secondary butyl alcohol is used as an intermediate for the preparation of secondary butyl xanthate for use in ore flotation processes, and also as an intermediate in the chemical synthesis dyestuffs, flavourings and perfumes.

An interesting product of side reactions occurring during the formation of isopropyl alcohol is isopropyl ether. This compound, having a lower volatility than ethyl ethers, is of particular value as an extraction solvent.

[Shell Photographic Unit

The scale of the engineering achievement at Stanlow is revealed in this view of the distillation unit and its battery of fractionating towers

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Suppressing Foam in Lubricating Oils

LUBRICATING oil can be satisfactorily defoamed by recycling it through a column of activated charcoal. This tendency to foam in use has consistently been a problem of internal combustion engine lubricants, since it impedes oil circulation, and reduces its lubricating efficiency. Searching for an answer to the problem, the U.S. National Advisory Committee for Aeronautics financed a series of experiments at Stanford University, and while the information gathered and embodied in the current report relates only to aircraft lubricants, the results may have broader application.

Experiments at Stanford showed that when a particular type of aircraft lubricating oil had been recycled through a charcoal column at 50° C. or lower, it produced, at 100° C., only one-tenth the volume of foam arising from untreated oil. Activated magnesium oxide, silica gel and Porocell, when packed in columns for recycling, also defoamed the oil to a lesser extent.

Extraction of oil with liquid sulphur dioxide, phenol or aqueous sodium hydroxide failed to produce any significant change in the tendency to foam. Nor did the dispersion of finely divided sodium chloride, followed by filtration.

The report notes that, despite the success of the charcoal defoaming method, the relatively little knowledge available concerning the nature of the action, or the constituents responsible for foaming, makes further study of the subject advisable.

Details of the present findings are contained in the newly issued "Attempts to Defoam Existing Oils by Processing," Technical Note 1845.

FLOATLESS LIQUID LEVEL CONTROL

Development of the Automatic Principle

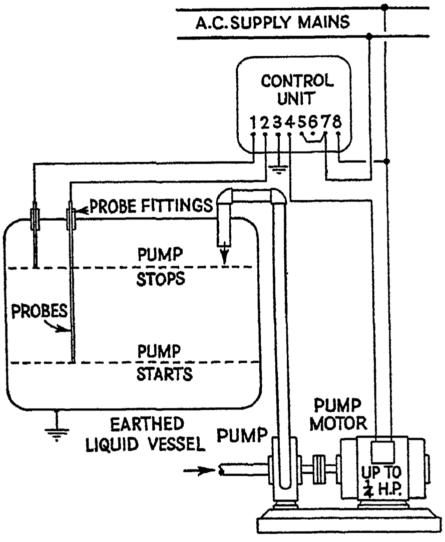
AN important feature of a new automatic floatless level control unit, now available, is its high and adjustable sensitivity which enables it to be used with liquids of extremely low electrical conductivity. A good example of this is in the control of foams and highly aerated substances which formerly could not be dealt with satisfactorily by any commercially available floatless control.

The Elcontrol floatless level equipment is applicable to the majority of the more common chemicals, and a selection of probe fittings of various metals and insulating materials has been developed to give a long life with corrosive liquids.

The system is designed to promote a considerable extension of automatic control.

A number of units can be used jointly to proportion different liquids entering a mixing vat. Probes can be positioned in the tank to ensure that the correct volume of liquid enters and as each liquid reaches its maximum level it would serve to switch off the supply and to open a valve to admit the next liquid to the tank, and so on.

Where high purity fluids are being handled, probes consisting of platinum wire may be sealed into a glass vessel, thus giving complete freedom from contamination. In this way it is possible to handle double distilled water in a distillation plant.



[Courtesy of Elcontrol, Ltd.

A typical assembly of a two-level automatic control

It is worth noting that for pressurised containers probe fittings can be produced to withstand pressures of up to 3 tons p.s.i.

Electrolysis is completely eliminated by the use of a small a.c. voltage applied to the probes (6 volts). The control is also recommended for inflammable liquids.

In the application of the Elecontrol automatic floatless level control, type LL.1, as a high level alarm a single probe reaches to the point in the liquid vessel at which an alarm is to indicate the presence of liquid at its highest permissible level. A second "earthing" probe is necessary in all cases where the liquid vessel is glass lined or of an insulating material.

The alarm device may be a bell, indicator lamp or siren. An electric valve or pump may also be connected to restore normal conditions by removing excess liquid from the tank.

As a low level alarm a single probe is positioned in the tank to detect a fall in liquid below its lowest permissible level. An electric valve or pump may be connected to replenish the tank.

In either of these applications a pen recorder may be used to show the periodicity of abnormally high or low levels.

In some circumstances it is convenient to connect the control so that a high or low level warning is maintained until the circuit is reset manually by means of a press button. This is advisable when the liquid is surging and turbulent, otherwise the alarm would operate intermittently as the liquid made momentary contact with the probe.

Another arrangement to provide automatic resetting uses two probes. These are adjusted in length to give a small differential (according to local conditions). Connected as a high level alarm, when the liquid makes momentary contact with the upper probe the relay will energise to operate the alarm and transfer control to the lower probe. The alarm is then maintained until the level falls below the lower probe, when the relay de-energises to restore control to the upper probe. The alarm ceases.

CURRENT WORK AT THE CRL

Useful Advances in Metal Protection and Insecticides

WHILE many of the exhibits at the Chemical Research Laboratory, shown to scientists and the Press last week, represented steady developments in lines of work previously announced, some entirely new results also were revealed.

A great improvement has been made in the formulation of improved corrosion inhibitors for use in heat exchange systems. It has been found that sodium benzoate—previously indicated for this purpose—may be used in conjunction with sodium nitrite. Both laboratory tests and tests in working cooling systems are still in progress, but current results are very encouraging.

For example, an anti-freeze solution containing 20 per cent ethylene glycol, 1.5 per cent sodium benzoate and 0.1 per cent sodium nitrite has afforded excellent protection to metals in the cooling systems of motor vehicles in individual runs of 2500 miles each.

This combination of chemicals may also be incorporated in rubber latex and used for the "temporary" protection of fabricated iron or steel parts during storage or transport. Simple dipping of the article in the treated latex produces a film which combines some degree of mechanical protection with protection against corrosion. Machined surfaces covered in this way have remained perfectly bright under tests involving drastic conditions of humidity and moisture precipitation; in the absence of inhibitor rusting quickly develops beneath the film.

When no longer required the film can be readily removed by simple "peeling," without the use of solvents. Patents have been applied for in respect to these developments, *i.e.*, Nos. 10471/49 (heat-exchange systems) and 10703/49 (rubber latex).

Tar Derivatives

In the field of coal-tar derivatives acenaphthene has been dehydrogenated to the potentially valuable unsaturated hydrocarbon acenaphthylene and the latter has been examined as a source of industrially valuable plastics. High molecular weight polymers have been prepared by polymerisation of acenaphthylene and an interesting series of copolymers with styrene, isobutylene and butadiene has also been produced.

Copolymerisation with acenaphthylene brings about a marked elevation in the softening point of polymers. Determination of the composition of styrene-acenaphthylene copolymers, which is very difficult by other means, is now being easily achieved by studying their ultra-violet absorption spectra.

Specimens of gallium and germanium metals extracted from flue dusts derived from British coals were exhibited, as well as their compounds. The degree of anistotropy of gallium is unique. The ratio of thermal (and electrical) conductivities along the three principal axes is 1 : 3.2 : 7. By controlled seeding of the molten metal it has been possible to produce bars of various conductivities composed of single crystals. No applications of this unique property have yet been devised.

Hydrogenation Studies

The hydrogenation of diphenylene oxide and *o*-diphenol has been studied. Exhaustive hydrogenation of diphenylene oxide over a Raney nickel catalyst affords perhydrodiphenylene oxide, but some cleavage of the furan ring also occurs with the formation of cis-*o*-cyclohexyl cyclohexanol and cis-dicyclohexyl. Partial reduction gives tetrahydro-and hexahydro-diphenylene oxide.

The latter is also obtained by partial hydrogenation of *o*-diphenol, water being eliminated from the hexahydro-diphenol with ring closure. The existence of this hexahydro-diphenylene oxide, hitherto in some doubt, has been definitely established by examination of its ultra-violet absorption spectrum.

New insecticides have also been produced. During the high pressure hydrogenation of pyridine over a Raney nickel catalyst at temperatures over 180°C. some hydrogenolysis of piperidine occurs, with the formation of a mixture of high-boiling bases, prominent constituents of which are N-n-butyl piperidine, N-cyclopentyl piperidine and NN′-pentamethylen dipiperidine. The crude mixture of hydrogenolysis products has been shown to be toxic to *Calandra granaria* and *Blatella germanica.* The constituents responsible for this insecticidal activity have been identified.

N-cyclopentyl piperidine has a rapid knock-down effect while the pentamethylene dipiperidine shows a slower form of the same property, followed by high rate of kill. A systematic study of N-substituted piperidines and other nitrogen-containing compounds is in progress.

ITALY'S OIL AND GAS

Big Expansions Proceeding

THE growth of oil technology and the implementing of the Italian-American programme to make Italy one of the main centres of mineral oil refining and storage in Western Europe (THE CHEMICAL AGE, *60*, 240) are reflected in further news from Italy.

Indicating the scope of one of the several refinery plans is the news that the installation in the Massa-e-Carrara region, between Liguria and Tuscany, to which approval has just been given, will be capable of processing annually some 2 million gal. of crude oil—from the Middle East. The plant will incorporate a furfural extraction plant for heavy lubricants and a continuous refinery for benzine and medium and heavy products. Total output will include 312,000 tons motor spirit, 546,000 tons gas oil, 1,113,000 tons fuel oil, as well as agricultural special fuels lubricants, white oil, bitumen, etc. The new refinery will be connected with the port of La Spezia.

Refinery and Docks

Another large refinery will be erected near Augusta, in Sicily, by the Raffineria Sic Olii Minerali, with rail connections and pipe lines to the large reservoirs of Punta Cugno. A large new dock, financed by ERP funds, is being constructed at Naples, capable of berthing five large oil-tankers.

In connection with the hydrogenation of mineral oils the A.N.I.C. (Azienda Naz. per l'Idrogenazione dei Combustibili) has just patented a new method for catalyst preparation consisting of oxides of elements of the 3rd, 4th, and 8th groups or of any other element capable of breaking the C-C, C-H, and H.H bonds. It may be used in processes intended either for high octane products or for refining lubricating oils.

Chief interest in the mineral fuel programme at the moment centres, however, in the natural gas resources. During 1948 and the current year the A.G.I.P. (Az. Gen. Ital. Petroli) in its exploration and development work has included rich discoveries near Lodi, of methane; the working of which by the end of this year will be sufficient, it is estimated, to supply the industrial needs of Lombardy and Emilia—more than 1 million cu. m. of gas per day. Already several supply pipe-lines have been installed from Caviaga, and it is expected that the important line to Milan will soon be completed. The gas is at such high pressure that difficulty is being experienced in controlling its flow.

In the March-April issue of *La Ricerca Scientifica*, Mario Medici is an interesting description of the methane occurrences in the Triveneta district, mainly in the Venice and Rovigo provinces, where, in 1948, depths of 400-500 metres were reached and gas yields of 500 cu. m. per day.

A graph is given showing national production in 1948 as about 120 million cu. m. annually, against 90 million in 1947.

(*Continued at foot of next column*)

G.E.C. RESEARCH

Fluorescence & Radiation Techniques

THE three-day conversazione organised by the General Electric Co., Ltd., at its Wembley laboratories last week, included tours of the research laboratories, for the Press, representatives of industry and universities, and for the general public.

So interlinked are developments in technical progress that these laboratories, mainly concerned with electrical and illumination matters, offered an unexpectedly large variety of material of interest to the chemist.

In the fluorescent lamp, for example, the new fluorescent powders which give the desired colour without the blending of separate powders, were on display.

The metallurgy laboratories have been successful in the preparation of nickel alloys, with controlled concentrations of aluminium or magnesium and other metal compounds, to enhance the high-temperature strength of fine filament wire. A heavy alloy composed of tungsten, nickel and copper is also manufactured by powder metallurgy. Its high density of about 17 gm. per c.c. makes it particularly suitable for screening of radiations and for radium containers.

Among the conventional Geiger-Muller tubes displayed was an unusual 5 ft. high monitor, designed to stand alongside the doorways of research laboratories to detect the entry of unwanted sources of radiations during the course of radiochemical research.

Molecular resonance at millimetre wave lengths was also displayed by the effect in ammonia; as the pressure was reduced from atmospheric, the absorption of a signal of wavelength around 1.25 cm. was reduced and then split into narrow bands. Knowledge derived from these observations by wavelengths has greatly improved our knowledge of fundamental molecular structures.

THE EXTRUSION OF POLYTHENE

Successful Production of Large-Diameter Tubes

by E. G. FISHER, M.P.S.*

IN describing recent developments in the extrusion of polythene, and in particular the extrusion of large-bore tubes, it is necessary to pay some attention to the extrusion process as it applies to the plastics industry generally.

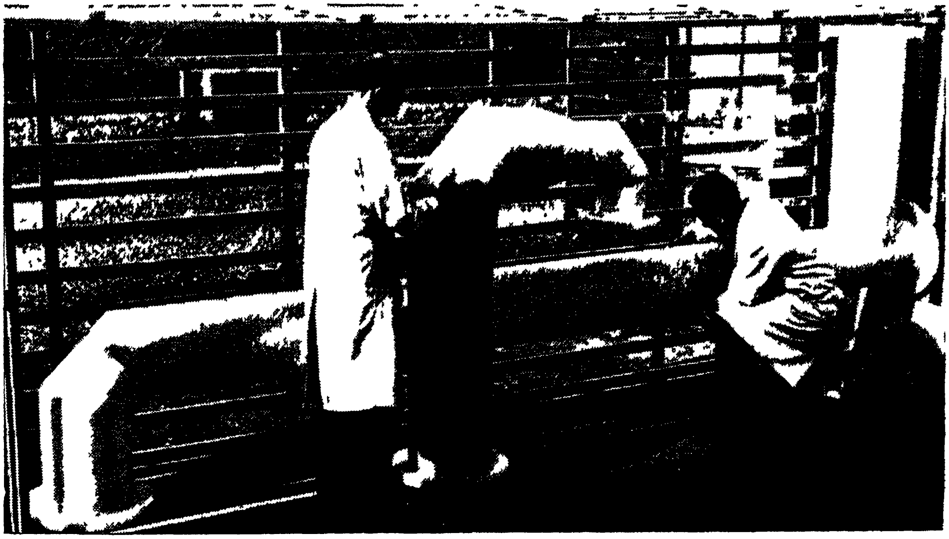
The extrusion process has been in use for many years in the metal working industries and the rubber industry has developed its own technique for the production of tubes and other products by extrusion. The adoption of this technique by the plastics industry, is, however, a relatively recent development, and much experimental work is continually being carried out in a search for greater outputs, and to increase the range of products which may be produced by this process.

The machines used in the plastics industry for the extrusion of thermoplastic materials were developed from the original rubber forcing machines in which a rotating, water-cooled thrust screw operates in a hardened steel, heated cylinder.

The plastic material, usually in the form of chips, or kibbles, is fed in at a uniform rate by means of an electrically or mechanically operated vibrating mechanism to the rear end of the cylinder, and is picked up by the rotating thrust screw. It is carried forward through carefully controlled progressive heat zones and is finally forced out through the extruding die. Temperatures and other detail operating conditions are obviously dependent on the characteristics of the particular plastic being processed and may vary considerably.

The extruded thermoplastic passes from the extruding die in a very soft and plastic state which necessitates the exercise of extreme care in its handling. The finish and accuracy of the extrusion is determined to a large degree by the ingenuity and success of the method of take-off, and the equipment necessary is frequently more costly and certainly more intricate than the extruding machine itself.

The plain extrusion of polythene, that is, the simple passing of the material through the extruder, is not difficult, the plastic flows readily, does not easily decompose or burn, nor does it adhere to the thrust screw as do some other thermoplastics. Unfortunately, however, it melts



A polythene installation of 12-in. tubing being made ready for shipment to Canada where it will replace iron equipment sharply at approximately 110°C., and does not soften over a wide range in the manner, for example, of the vinyl plastics, and in consequence, under correct extruding conditions it passes from the machine as a viscous liquid and immediately loses all identity as an extruded product.

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* Director of Technical Development, Tenaplas, Ltd

Polythene can be extruded at temperatures somewhat below the melting point of the material, and if this method is adopted a recognisable product can be more readily obtained. It is obvious, however, that unless the thermoplastic is taken at least to its melting point, the resultant extrusion will be under internal strain, and will almost certainly fail in service.

Tenaplas, Ltd., devoted some years of experimentation and research to developing a satisfactory commercial method of handling the extruded molten polythene. That the time has not been wasted is obvious from the fact that extruded polythene tubing of 12 in. bore with a $\frac{3}{8}$ in. or $\frac{1}{2}$ in. wall is now commercially available.

To permit the production of tubing up to 12 in. and even larger required much work in the adaptation of existing extruding equipment. The standard extruders to be used for this purpose were considerably modified in order to obtain the very large output of extruded plastic and to ensure a reasonably constant internal pressure.

The thrust screws were replaced by others of special design, calculated to give the optimum working conditions with polythene type plastics, and careful attention was given to the clearance between the thrust screw and the cylinder. The extruding dies presented a further problem, and many different designs were constructed and discarded before the type at present being used was adopted.

[Photographs by courtesy of Tenaplas, Ltd.

This assembly, showing the type of jointing successfully employed, is of the kind most suitable for the conveyance of acids

The success which has been obtained by Tenaplas in its new products has resulted from the logical and painstaking approach to a difficult task; the three main factors contributing to this success are:—

(a) The extruding machine; (b) the extruding die; (c) the take-of method; and in each case difficulties which at times seemed insurmountable have been overcome. The designs of the Tenaplas extruding equipment are at present secret.

INDIA SEEKS TO DISPENSE WITH IMPORTED PLASTICS

THAT manufacturers of plastics in India should produce urgently needed industrial articles and utility goods cheaply is the recommendation of Mr. G. L. Mehta, president of the Indian Tariff Board, speaking at the inquiry into the claim for protection and assistance to the Indian plastics industry. For the industry to be sound it must be freed from dependence on imported raw materials, he said.

"It should be our ambition," Mr. Mehta said, "to produce plastics by developing our own resources and technique." Sixty firms were at present engaged moulding plastic goods in India, but not all of them were well organised, or even in full production, according to the speaker.

The Government of India, he added, had taken a keen interest in the development of the plastics industry. As evidence of this, he mentioned the proposed central factory for the manufacture of moulding powders, and schemes to develop natural and synthetic resins under the auspices of the Council of Scientific and Industrial Research.

EDUCATION FOR CHEMICAL INDUSTRY

Academic and Technical Qualifications Compared

THE methods by which those intending to enter chemical industries can obtain degrees and academic qualifications were discussed at length at a joint meeting of the London and South Eastern Counties section of the Royal Institute of Chemistry, the London section of the British Association of Chemists, and the London area branch of the Association of Scientific workers held recently in London.

The proceedings took the form of a symposium on "Part-Time Education in Chemistry," and the chair was taken by Mr. H. L. Howard, chairman of the BAC.

The first speaker was Dr. P. C. L. Thorne, who took as his subject "Organisation and Official Encouragement." Dr. Thorne said there were in the chemical industry a number of potential "degree" men who, for reasons beyond their control, had been unable to proceed to the university. If such men wished to qualify in the profession of chemistry, they were obliged to obtain their qualifications by means of part-time education.

Normally, a man embarking on a course of part-time study would enrol at his local technical college for evening classes in the appropriate subjects. In some cases his employer would allow him time off for the purpose of attending classes during the day. Part-time releases of that kind were of benefit to both the student and the college authorities; to the student because it enabled him to attend classes during the day when he was fresh, and to the college authorities because it enabled them to relieve the evening congestion in classroom and laboratories.

Qualifications Obtainable

Provided he possessed the necessary ability, a student was able, through part-time education, to proceed to any qualification in the chemical profession, *e.g.*, national certificate, City and Guilds certificate in chemical technology, A.R.I.C., and the external B.Sc. degree of the University of London.

The education authorities took an active interest, in addition to providing financial assistance and advice to local technical colleges.

Dr. Thorne was followed by Dr. H. J. Barber, speaking on "Industrial Schemes," who said that 20 years ago all part-time education was done in the students' spare time; there was no large-scale organised support for the part-time student.

In recent years many factors had operated both for and against the part-time student. The expansion in chemical knowledge had resulted in examining bodies increasing their syllabuses. On the other hand, many firms now worked a five-day week and allowed students up to a whole day per week leave of absence to attend classes. In some cases financial assistance was also given.

Fight Against Odds

From a survey of present conditions, it appeared that, despite concessions by employers, fewer students were winning through to good degrees. The part-time student was fighting a gallant but losing battle against an overwhelming force of circumstances, and there seemed to be little that industry could do to help him. It appeared that the A.R.I.C. rather than the degree would be a better target for the part-time student to aim at, but even so the difficulties were still considerable.

To obtain a solution to the problem, it might be necessary to re-examine the requirements of the chemical industry. There appeared to be a need for skilled technicians in laboratories to develop the new techniques which emerged from fundamental research. The function of the research chemist and the skilled technician were complementary, and an insistence on young men studying for academic degrees, with a tendency towards more theory and less technical skill, might result in the chemical industry lacking skilled practical men able to develop new discoveries.

In one organisation a grade of laboratory technician had been instituted and sub-divided into apprentices, technicians and senior technicians. Technicians did not receive leave of absence to follow a degree course; some were studying for A.R.I.C. and some were receiving training in laboratory arts.

Nothing had been said so far about the technical diplomas issued by technical colleges to replace university degrees. A further development of such diplomas would be valuable to the chemical industry. It might appear to some that there was no future for the young chemist unless he could obtain a degree or similar professional qualification. On the other hand, it must be realised that at the present time society was re-valuing most of the services and duties which its members performed, and the old qualification labels would tend to lose their significance.

The dominant factor in the future would be the capability of a man to do a job, and it would be increasingly recognised that the practical technician made a contribution comparable with that of the theoretical chemist and should receive a salary, working conditions, etc., compatible with such a status, concluded Dr. Barber.

Methods of Study

Dr. K. G. A. Pankhurst then spoke on " The Student's Viewpoint," saying there could be no doubt that a full-time course was the best method of studying for a degree in chemistry and that part-time study could not be more than the second best. A student embarking on a degree course would probably do so for two reasons: first, to gain admission to the profession, and second, for economic reasons since, other things being equal, the degree man could command a higher salary.

Participation in part-time courses might be attributed to the economic necessity of earning a living in the absence of financial backing to permit full-time attendance at a university, or to the fact that the student had not a " scholarship brain " which would win a free place in the university.

Formerly, evening classes used to be merely intensified versions of full-time courses, with the result that practical work was often skimped and insufficient time given to learning technique. With part-time day releases, longer periods in the laboratory might be possible and the differences between day and evening classes reduced.

In some instances the student could overcome difficulties by strict attention to detail, and by developing an inquiring mind and not being satisfied merely with a " digest " outlook. A part-time student's college activities were likely to be confined to attendance at classes with little opportunity to meet his fellows and discuss subjects other than chemistry. This led to a narrow outlook. Having acquired his degree, the minimum requirement for entry into the profession, the student had also to learn to mix with his fellows. This he could not do successfully if his training had made him narrow minded and unable to discuss anything other than " shop."

Dr. Pankhurst was followed by Dr. A. M. Ward, who spoke on " Qualifications and Their Status." Dr. Ward said that of the qualifications open to the part-time student of chemistry—the external London B.Sc., A.R.I.C., City and Guilds diplomas, and the national certificate—the last was for some inexplicable reason, not valued at its true worth by chemical industry, particularly in the south of England. Perhaps interest in that qualification would be revived if it were made a definite step towards the A.R.I.C.

The City and Guilds diplomas in technology, while enjoying a somewhat fuller recognition than the national certificate, were not rated as highly as an academic degree. That might be attributed to a reluctance on the part of chemical industry to view the matter in the proper perspective and obtain the true balance between theoretical chemistry and technical skill. In that connection the comments of Dr. Barber were particularly significant.

At the present time, the A.R.I.C. and the university degree were held in approximately equal status. However, that position might change in view of the proposed changes in the London B.Sc. degree. Not only were those changes likely to alter the character of the degree, as compared with the A.R.I.C., but the extended syllabus might deter many from tackling the degree by part-time study and lead to an increase in the number of students offering themselves for the A.R.I.C.

In considering the whole question of qualifications and their status, it must be realised that, while some students were capable of obtaining the highest possible qualifications, others, due to a limitation of their natural talents, had to be content with a more modest qualification. Clearly, if the latter class of chemist was to serve a useful purpose in the community, revision of the status attached to the various qualifications was necessary.

Technical Aspect

At this point Mr. H. L. Howard relinquished the chair to Dr. J. G. A. Griffiths and spoke on " Chemistry and Technology." Mr. Howard said, in technology, as distinct from science, it was the technological subject which was the main subject and the science subjects were the ancilliaries. To technologists lacking a good scientific background it was essential to present the technology from the practical angle at the outset and so maintain interest, while unobtrusively building up the scientific background.

This could be done by starting from the

finished article and working backwards to its components, the components then being studied in more detail, so that by the time the more involved studies were reached, the necessary background had been provided. Thus, while the national certificate in chemistry might be regarded as a definite qualification in chemistry, it was to the City and Guilds diplomas that one looked for the competent technologist.

It was often forgotten that, where the ancilliaries might appear inadequate by other standards, the necessary scientific background was of necessity incorporated in the technological instruction, so that the training received would be of a much higher order than might be construed from reading of the regulations.

In recent years an extension of national certificates to applied science required a mere three evenings—one in each of the last three years of a five-year course—in technology, and those were obtained at the expense of three evenings' science provided in the national certificate in chemistry. That was quite inadequate to cover in an effective manner any technology, and the successful candidate would be neither chemist nor technologist.

Training and Status

Another aspect which was causing grave concern was the failure to provide equivalent status at definite stages in training as between University, national certificate or City and Guilds studies. It should be possible to switch without having to go back to the beginning. That might easily be done where the student decided to drop a university course in favour of a less onerous training, but was often not possible in the other direction.

It should be possible to obtain credit on a subject for subject basis at the matriculation, intermediate and subsidiary subject stages or their equivalents, so that a student switching from technology would not be debarred from university training merely because he had not passed matriculation at the outset. It was also wrong to encourage students to take national certificates in chemistry, only to find that they were debarred from proceeding to the A.R.I.C. or a degree, or even to find that they were not regarded as competent chemists or denied the status of chemists.

Mr. Howard appealed to the Ministry of Education and the Royal Institute to give careful consideration to this aspect, especially in so far as it affected students' right to acceptance by the Central Technical and Scientific Register.

Again, there was a marked tendency in connection with apprenticeship schemes and for various technical bodies to draft syllabuses for "special ancilliary subjects," containing only the minimum science applicable to a particular technology. Those differing syllabuses necessitated separate classes, and being so one-sided would not be acceptable in lieu of "straight" ancilliaries of the national certificate type.

Encouragement Needed

Mr. Howard advocated "straight" ancilliaries as being more beneficial to the student and providing that sound scientific background which was so essential to the technologist.

In the course of the discussion which followed the talks, Mr. Newland pointed out that in the past there were plenty of chemists on the labour market, but to-day the position was reversed and employers had often to train their own staff. If young men coming into the chemical industry were not encouraged to take a degree, industry would suffer. Even if industry paid attention to that point, difficulties might arise unless the right type of man were engaged.

What steps should be taken to train the university graduate who possessed no technological background? If he were advised to take up one of the City and Guilds courses, said Mr. Newland, he might be disappointed and fall back on the textbook. Such a step would be a loss to industry.

Was it considered necessary for apprentices to undertake part-time education, and if so, what courses should they take? What was the difference between the standard required for matriculation and the new examination which had replaced it?

Mr. Howard, replying, said he thought that when a new graduate came into industry it was a good plan to let him see over the works and study the plant and processes. Admittedly, any course such as the City and Guilds diplomas might prove disappointing to a graduate in the early stages, but the student must give the lecturer a fair hearing and allow him to develop his subject as the course proceeded.

Apprentices

Where a firm had a sufficient number of post-graduate students requiring special instruction, it was usually possible to get a suitable course provided. With reference to training apprentices Mr. Howard advocated a policy of starting with the technological aspects of the subjects and leading up, from that, to the scientific background.

Dr. Ward, replying to Mr. Newland, said he considered that it was the function of the technical colleges to provide courses of instruction, but that it was up to industry to provide the instructors by allowing its trained technical staffs to lecture in the technical colleges. On the subject of matriculation and the new general certificate of education, he admitted that care was needed when interviewing a candidate who offered the new certificate. It was advisable to scrutinise the subjects taken in the examination to ensure that the candidate had reached the necessary standards in the subjects which the employers considered to be required for the post.

Mr. Martin, referring to the potential "degree men" who had entered industry before acquiring university honours, questioned whether it was worth their while to continue studying for a university degree in view of the proposed increase in the syllabus.

More Time Required

Mr. McLachlan, speaking on the opportunities open to the part-time student, reminded the meeting that the only candidates for a recent public appointment were all part-time students. However, in view of the increased syllabus that was proposed, he considered that more time should be allowed for the courses and suggested that National and higher certificates should be made stepping stones to professional qualifications such as the A.R.I.C.

Mr. Miall drew attention to the fact that up to the present the university degree and the A.R.I.C. had been generally accepted as equivalent qualifications. However, the new university regulations were likely to change this and produce differences in status between the two qualifications. Were chemists, he asked, going to accept this as inevitable? He suggested that the chemical organisations should consider the question very carefully and try to persuade the examining bodies to adopt a more equitable policy towards the part-time student.

The General Degree

Dr. Wilkinson pointed out that little mention had been made of the London general degree. There was undoubted scope for people with this degree. For instance, in chemical pathology a man holding a general degree was in a strong position, and he thought the discussion on the special degree had tended to cloud the position. He thought that candidates for the special degree who were disturbed by the new regulations should take the general degree.

Mr. Freeman considered that the effect of the new regulations might be to influence some students to sit tight, to take no examination at all and then, having reached the age of 30 and achieved a relatively important position in industry, to apply for the A.R.I.C. He considered this to be an unsatisfactory state of affairs.

Mr. Collett said he did not intend to express the official view of the Royal Institute of Chemistry, but he would like to put forward an idea in connection with the difficulty of organising courses. In large colleges the overloading of courses generally took place in the earlier years, while in the smaller colleges, probably more convenient to the student for geographical reasons, it was difficult to get teaching staff.

He thought it was possible for the smaller colleges to deal with the students in their earlier years so that they could be passed on to the larger colleges only for the later years of the course.

Commenting on the "tired mind" of the part-time student, he considered that in many cases this was due to the student failing to connect intelligently the theoretical instruction he received in the evening with the works experience he was gaining during the day. On the vexed question of new university regulations, he thought there was a real danger of students becoming discouraged by the piling on of new requirements for the degree examination. At the same time, he warned students against falling into the trap of regarding the A.R.I.C. as a "soft option" if the degree seemed impossible.

Welding Prize Competition

SIGNALISING the 30th anniversary of its foundation, the Soc. La Soudure Electrique Autogène, S.A. Procedé "Arcos" of Brussels, has announced an international prize competition, with three prizes of Fr.60,000, Fr.40,000 and Fr.25,000 and five subsidiary awards of Fr.5000 each. It is open to all, without regard to nationality. The competition calls for a thesis on a branch of welding, *e.g.*, metallurgy of arc welding, nature and properties of the electric arc in air or other atmosphere, study of strains or deformations in arc welding, properties of electrodes and various modes of use. Papers must be in French or have a French translation, and a 20-line abstract of text. They should reach the Chambre de Commerce de Bruxelles not later than May 1, 1950.

Technical Publications

FINE chemicals of high purity and reagents to meet exacting standards are more than ever in demand today. The issue of the new catalogue of laboratory chemicals and testing outfits by The British Drug Houses Ltd., fortunately, coincides with an encouraging improvement in reagent supplies. Among the new features of the catalogue is a section devoted to amino acids which are now being made in substantial quantities. Full details of concentrated volumetric solutions are given, and an extended series of special indicator papers with colour standards for pH determination has been introduced.

* * *

SECTIONS on glycerine and some glycerine derivatives from Beilstein's "Handbuch der Organischen Chemie" (Handbook of Organic Chemistry), 4th edition, published and copyrighted in 1918 have now been translated into English. The German interests in this work were vested in the U.S.A. in the Alien Property Custodian in 1942, 1943, and 1946. The translation was made by a board of three translators and five editors from the staff of the research laboratories of the Glycerine Producers' Association, New York, under licence. The book (210 pages) is thoroughly indexed and covers the glycerine aspects of the literature to 1910 in the main work, 1910-19 in the first supplement and 1920-29 in the second supplement volumes 1-6. This edition is available at $2.50 per copy from the Glycerine Producers' Association, 295 Madison Avenue, New York, 17.

* * *

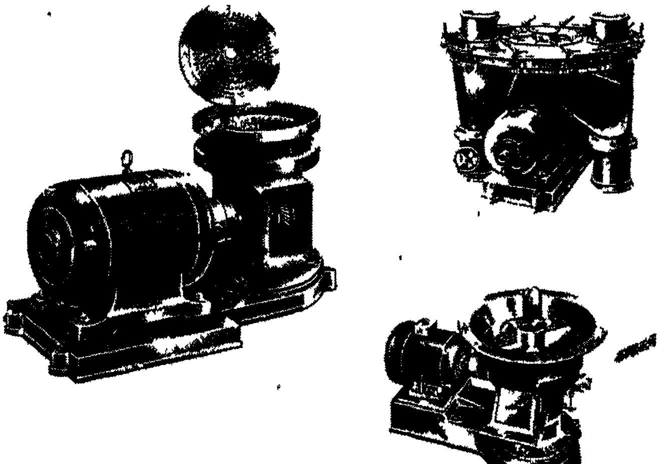
A NEW mobile apparatus of low power for heat treatment of small parts has been devised by Phillips Electrical, Ltd. This model, type F.5, a 2.5 kW high frequency generator is described in the company's latest catalogue now available.

* * *

THE wide range of chemical products now handled by the Jan de Poorter organisation, of London (12 Cheapside, E.C.2), Brussels and Rotterdam, is shown in its newly issued directory of materials in English, French and Dutch.

* * *

A POTENTIAL stimulator to sales from this country to Europe and South America is "The Directory of British Rubber Manufacturers and Products" just issued by the Federation of British Rubber Manufacturers' Association. The directory is in English, French, and Spanish. It comprises an index of manufacturers giving their works and office addresses and overseas agents; list of products and their manufacturers; a section devoted to the tyre industry; index of trade marks and trade names, and a section of advertisements.



These grinding, blending and emulsifying mills, which are competing favourably in world markets, have a high speed centrifugal action. Materials are kept cool and clogging is prevented by the inflow of air and fanlike action of the rotary disc. Simplicity of construction allows quick and easy clearing (Kek, Ltd.)

Rising Scale of French Production

Most Chemicals Substantially Increased in 1948

FACTUAL evidence of the extent to which French chemical and allied industries have recovered from wartime disturbances is afforded by the official total tonnages recently released, which in most instances indicate that the production increases recorded between 1934 and 1947 continued at a proportionately higher rate in 1947-48. The only field in which the general tendency was reversed was, expectedly, that principally dependent on vegetable oils and fats.

The principal totals for the three years (in 1000 metric tons) were these:—

	1948	1947	1938
Crude tars ...	419	390	519
INORGANIC			
Sulphuric acid ...	1,257.2	1,061	1,272
Ammonia ...	188.2	167.5	222
Calcium carbide	170	147.6	156
Caustic soda (solid)	715.2	593.3	480
Electrolytic soda (solid)	186.2	169.3	114
Chlorine, gas ..	64.4	57.7	46.8
Sulphur ...	76.5	79.5	99.6
Copper sulphate	64.9	72.5	81
Arseniates ...	11.3	10.5	4
Sodium silicate ...	30.5	20.1	15.5
Chromium bichromates and sulphate ...	2.8	2	1.2
Sodium sulphate	58.9	48.2	60
Hydrochloric acid	130.6	104.3	120
Carbon disulphide	25.3	18.3	9.6
Borax	8.6	9.2	4.8
Iodine	0.02	0.026	0.048
Oxygen (cu. m. 1,000)	48,000.0	42,439.4	22,200
FERTILISERS			
Superphosphates	1,620.5	1,415 5	1,368
Compound ...	905.1	896.1	1,373
Compound ...	905.1	896.1	1,373
Nitrogen ...	168.6	131.7	188.4
Ground phosphates ...	247	251.0	150.0
ORGANIC			
Acetone ...	3.3	3 1	2.3
Ethyl acetate ...	2.5	1.8	0.96
Methyl alcohol ...	16.3	15.0	7.9
Formaldehyde ...	6.25	5.95	1.56
Butyl alcohol ...	1.7	1.75	1.03
Tricresyl- and trixylen - phosphates ...	0.4	0.356	0.072
Benzol products	61.23	52.4	75
Fatty acid condensation products	6.3	6.2	—
Synthetic phenol	7.74	6.9	8.8
Phthalic anhydride	2.05	1.7	0.7
Methyl chloride...	0.5	0.33	0.98
Ethylene-glycol...	0.45	0.6	—
Monoethanolamine ...	0.36	0.28	0.41
OILS, FATS, SOAPS, ETC.			
Toilet soap ...	14.4	12.28	16.4
Household soap...	100.7	77.76	229.25
Detergents ...	66.41	73.03	90.48
Shaving preparations	1.79	2.14	0.98
Industrial soaps and misc. ...	32.36	13.95	93.12
Stearine	3.43	2.02	11.73
Oleine	3.5	2.2	0.95
Other fatty acids	14.0	17.0	19.5
Distilled glycerine	5.43	2.79	6.7
Sapon glycerine...	1.64	1.67	1.98
Candles	2.14	2.81	8.96
Lithopone ...	14.83	11.56	15.96
Salicylates	1.32	1.2	—
Dynamite	8.7	7.53	5.72
Nitro explosives ...	7.0	6.7	2.67
Chlorate explosives	1.14	1.28	2.13

DOLLAR AID FOR FRENCH IRON AND STEEL

THE likelihood of greatly increased production of French iron and steel and rolled products, which should ultimately provide a good margin for export, is associated with the recent approval by the ECA authorities in Washington of large development schemes, involving liberal aid from American funds (THE CHEMICAL AGE, *60*, 592).

The project has been planned by SOLLAC (Societe Lorraine de Laminage Continu), a new entity organised and owned by eight Lorraine iron and steel companies and one Saar company, all under French management, with French majority ownership.

It is proposed to carry out the development and modernisation programme in two phases, the first of which would cost the equivalent of $62.82 million, including $29.82 million in ECA assistance for the purchase of equipment in the U.S.A. The second phase would involve an equivalent of $70.24 million, including $19.54 million in ECA funds for U.S.A. purchases.

The first stage is to be the construction of an 80-in. continuous hot strip mill with an annual capacity of 700,000 to 850,000 tons of coils, and the construction of a 5-stand, 48-in. continuous cold strip mill having an annual capacity of 350,000 tons of thin sheets and tinplate.

The second-stage proposes an 84-oven coke plant to supply existing blast furnaces at Hayange; new crude steel capacity of 500,000 tons per year; a new blooming mill to handle the requirements of the 80-in. hot strip mill; and a new continuous cold strip mill. These may be operating in 1952.

Sheet and tiplate are scarce in France and are still rationed, but controls have been lifted on most other steel items.

AMERICAN CHEMICAL NOTEBOOK

FROM OUR NEW YORK CORRESPONDENT

THE Celanese Corporation of America has developed a new process for the first large-scale production of low-priced paraformaldehyde in flake form, thus opening up the possibility of its use by the plastics industry and other consumers as a replacement for formaldehyde, of which 624 million lb. were used in the U.S.A. last year. The news is of particular importance to the thermosetting plastics producers, since it will afford marked advantages in reaction, storage, handling and shipping that may drastically change present production techniques and costs.

* * *

Paraformaldehyde is essentially formaldehyde in a polymerised form, with the important difference that it contains less than 10 per cent water, against a possible 63 per cent in commercial formaldehyde solutions. Hitherto there has been a limited market for paraformaldehyde because of a wide price differential between it and straight formaldehyde. The new Celanese chemical will sell for about 11 cents per lb. The 5 million lb. of paraformaldehyde made by other processes last year sold for about 24 cents per lb. The new product is more water soluble, less dusting in its flake form and is said to offer less variation in reactivity.

* * *

A new series of polythene resins for use as coating materials is now being produced in commercial quantities by E. I. Du Pont de Nemours & Co., Inc. Closely related to the Du Pont plastic, polythene, the new resins are highly resistant to chemicals and possess good electrical insulating properties at high and low frequencies. They are said to be tasteless, odourless, non-toxic and waterproof and to have very low vapour permeability. They are extremely light, of white, waxy appearance and can be prepared in flexible or brittle compositions. The resins are said to give papers a brilliance approaching that of a lacquer finish. They are essentially unaffected by long exposure to concentrated sulphuric, nitric, hydrochloric, hydrofluoric or acetic acids at room temperature, and are also fairly resistant to oxidising agents such as chromic acid or acid permanganate solutions.

A number of advantages are claimed for a new line of driers made from 2-ethyl hexoic (octoic) acid which is now being commercially produced. Their properties are said to include uniformity of composition; viscosity less than "A"; high stability of drier solution; drying power is equal to or better, and the solid content lower, than the naphthenate type of drier. The new driers are metallic soap solutions in a petroleum solvent. They are being marketed by the Witco Chemical Company, New York, which states that they are effective even under adverse conditions of high humidity.

* * *

An up-to-date list of standard samples issued or in preparation by the U.S. National Bureau of Standards, numbering more than 400, is now available free of charge from the Bureau's Publication Section, Washington 25, D.C. It relates to samples, comprising materials of certified composition such as metals, ores, and ceramics; high-purity hydrocarbons; certain high-purity chemicals; paint pigments for colour; oils for viscometer calibrations; melting-point standards; radioactive materials; and a number of reference standards, such as lamp, opacity, and reflectance standards. Representative uses of the Bureau's standard samples include the checking of chemical and instrumental procedures and the developing of new methods of analysis; calibration of spectrometers, spectrographs, pH meters calorimeters, pyrometers, and polarimeters, and the establishment of uniformity in test methods.

* * *

Cold fog can now be dispersed by the same " seeding " techniques scientists use to convert clouds into rain and snow, according to Dr. Vincent J. Schaefer, of the General Electric Research Laboratory, Schenectady, New York, who is a pioneer in the modern attempts at weather control. Scattering small quantities of dry ice or similar particles in a supercooled ground fog will cause the water droplets to gather into ice crystals so heavy that they can no longer remain airborne, he says. In warm weather the ice crystals melt as they descend to the earth and turn into rain. Many careful quantitative research experiments, however, must be conducted before eventual success in this field can be expected.

ISOLATING THORIUM

U.S. Claims Improved Methods

LARGER production of relatively pure thorium, a potential source of atomic energy, is being facilitated by improved methods of extracting the element from the sands in which it is found. This prospect was held out by three analytical chemists who evolved the new methods, speaking before the second annual Analytical Symposium of the American Chemical Society last week. The chemists are Dr. Louis Gordon, of Syracuse University, New York, C. H. Vanselow, a Syracuse student, and Prof. H. H. Willard, of the University of Michigan.

Supplementary Fuel

Although they have been concerned only with the laboratory study of the chemistry of thorium, their findings can be applicable to isolating the element on a large-scale industrial basis.

Thorium itself cannot serve as a nuclear fuel, but it can be converted in the atomic pile into a form of uranium called uranium-233 which, like the better known uranium-235, is fissionable.

Number 90 in the periodic table, the element, was discovered more than a century ago by the great Swedish chemist Berzelius, who isolated it from thorite. Most thorium now used in industry is obtained from the mineral monazite, mined chiefly in Brazil, India, and Ceylon although it also occurs in the U.S.A.

Monazite Problems

Many of the recent investigations inspired by the element's atomic energy possibilities have been directed toward determining the thorium content of monazite sand, according to Dr. Gordon and his collaborators. Up to now, however, analytical chemists have discovered that most of their procedures for separating the element from monazite yielded thorium compounds which were extremely difficult to handle, the chemists said. They were particularly hard to separate from an accompanying liquid containing impurities.

"The gelatinous and very slimy product both clogged the filter mechanism and also retained considerable impurities within its voluminous confines," the chemists reported.

The new separation methods developed by Dr. Gordon and his associates for analytical purposes produce a granular material similar to ordinary table salt.

U.S. SCIENTIST CHOSEN

Leader of Indian Research Group

THE appointment has been announced in India of Prof. James W. McBain, professor of chemistry at the U.S. Stanford University, as director of the National Chemical Laboratory now under construction in Poona. Prof. McBain, who is now in India on a preliminary four-week tour, hopes to take up his appointment from October, 1949, for a three-year period. The National Chemical Laboratory will begin functioning early in 1950.

The laboratory is intended to bridge the gulf between universities, the State and other scientific institutions on the one hand and the chemical industry on the other. It will assist group research and will also initiate fundamental research of its own. The laboratory will have a special interest in research to promote the fuller use of Indian raw materials.

Prof. McBain will have under him seven assistant directors for the fields of (1) inorganic and analytical chemistry, (2) physical chemistry including electro-chemistry, (3) organic chemistry, (4) chemistry of high polymers, (5) biological chemistry and biological evaluation, (6) chemical engineering and (7) survey and intelligence. The laboratory will have in addition to these directors, 11 research officers and a total staff of 310.

Prof. McBain, a Fellow of the Royal Society, was awarded the Davy Medal in 1930. He is a member of the American Chemical Society and has served as chairman of its Californian section and has been an officer of numerous other scientific societies.

New Mineral Sources

RESERVES of manganese ore have been discovered at Tirodi, in the Balagah district of the Central Provinces of India, by members of the Geological Survey of the Government of India. Investigation was undertaken at the request of the Central Provinces Manganese Ore Co., which has for some time past been engaged in mining operations in the area.

Other discoveries reported by members of the Geological Survey of India include: several large deposits of bauxite in the western part of Sambapur in Orissa, occurrences of magnesite near Ulipuram in the Salem district of Madras; and seams of coal on the west bank of the river Halso in the Bilaspur district in the Central Provinces.

◆ HOME ◆

£250 Gift

Imperial Chemical Industries, Ltd., Nobel House, S.W.1, has contributed £250 to the Forces Help Society.

Chemical Workers' Wages

An increase of 1½d. an hour has been agreed to for all male and female time workers aged 18 and over in the heavy chemical and fertiliser firms conforming to the decisions. These rates do not apply to the I.C.I. groups.

Licences Unnecessary

The existence of more plentiful supplies has persuaded the Ministry of Food to discontinue the licensing system for the manufacture of cod liver oil. The Cod Liver Oil and Veterinary Oil (Control) Order has been revoked as from July 1.

Aluminium for Bridge Building

The large-scale use of aluminium is contemplated for the new dock bridge at Aberdeen. It is proposed that movable parts of the bridge should be in aluminium and the permanent sections in steel. Only one previous bridge has used this combination.

Spanish Trade Prospects

Although satisfactory results have been reached in the trade and payments discussions between this country and Spain, it is not expected—says the Board of Trade—that a higher level of British exports will be reached until the usual rise in Spanish exports in the autumn makes available more sterling

Double Fatality

A man and a youth were gassed at the works of Millom and Askam Iron Company, Millom, Cumberland, on 3 July. Employed as a foreman erector and as an assistant gas plant attendant, they were at work on the gas plant when there was a rush of gas. They were overcome by the fumes and died almost immediately.

Coal Output Below Estimate

Production of coal for the first half of this year showed only a 2½ per cent increase over last year. Improvement at this rate would be little over five million tons, which is nearly two million tons less than the lowest assumption, while the main holiday season is yet to come. Actual figures were: deep-mined, 102,454,700 tons; opencast, 6,221,000. Last week's total output was 4,215,300 tons, compared with 4,320,200 tons the previous week.

Welders' Meeting

The annual meeting of the Institute of Welding will be held at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 2.30 p.m. on Wednesday next week.

Textile Institute's 4800 Members

The Textile Institute announces that more new members have joined the Institute so far this year than in any corresponding period in previous years. In the first six months of 1949, 465 were enrolled. The total membership is now 4800.

Chemical Society's Library

The library of the Chemical Society will be open from 10 a.m. to 5 p.m. daily, July 6—September 30, inclusive, except during the first fortnight in August, when it will be entirely closed for revision and cleaning.

Paper Control Changes

A number of changes in the conditions of paper control including a reduction by £5 6s. 3d. per ton in the price of lightweight newsprint were notified by the Board of Trade. Some types of pulp board and similar grades are released from price control.

New Address

The British Chemical Ware Manufacturers' Association Ltd., announces that its new address is: 17 Manchester Street, London, W.1, to which all communications should now be sent. Telephone: Welbeck 0161-3. Telegrams: Glasmanef, Wesdo, London.

Improved Air-Mail Service

Since July 1, second class mail for Canada (including Newfoundland), the U.S.A., and Mexico may be sent by air mail at the reduced air postage rate of 4d. per half oz. This new service will apply to printed papers, commercial papers, samples, and literature for the blind. Small packets may also be sent by this service to the U.S.A. and Mexico.

Dyestuffs Workers' Memorial

Mr. G. B. Jones, general works manager of I.C.I., Ltd., Dyestuffs Division, Dalton Works, Huddersfield, last week unveiled a new stone memorial plaque at the works entrance in remembrance of 22 employees who died on active service during World War II. Canon Frank Woods, the Vicar of Huddersfield, conducted the dedication service in the presence of a large attendance of workers.

◆ PERSONAL ◆

Mr. O. V. S. Bulleid, C.B.E., M.I.Mech.E., has been elected president of the Institute of Welding for 1949/50, and Mr. C. S. Milne has been elected vice-president. Mr. Bulleid, who is about to retire from his present post as chief mechanical engineer, British Railways, Southern Region, has been appointed consulting mechanical engineer to the Irish Transport Company (Coras Iompair Eireann). Mr. Milne is founder and head of C. S. Milne & Co., Ltd., Deptford.

The following changes in the board have been announced by Stemco, Ltd., London. Mr. B. T. W. Burgess has been elected chairman; Mr. S. Collier appointed managing director; and Mr. E. S. Stock and Mr. A. R. Speller elected directors. The resignation is also reported of Mr. D. C. James, Mr. R. W. Mogford, and Mr. D. A. Shepard. Mr. James has resigned because of his increasing duties as European representative for both the Atlas Supply Co., and the Gilbert and Barker Manufacturing Co. Mr. Mogford has done so in order to devote his full time to white oils and specialities in Europe on behalf of the marketing co-ordination division of the Standard Oil Co. (New Jersey). Mr. Shepard, as reported last week, becomes executive assistant to the president of the Standard Company.

The view that higher technical education, despite all the publicity given to it, was at the cross roads, and that the next ten years would be critical, was expressed last week by Prof. W. M. Cumming at a farewell party given by the staff of the Royal Technical College, Glasgow. A silver tea service was presented to the professor, anticipating his coming removal to the British Dyewood Co. Ltd.

Mr. W. J. Drummond has been appointed chairman of the North-Western Divisional Board, National Coal Board, in succession to Alderman J. A. Webb, who has relinquished the chairmanship for reasons of health. Mr. Drummond, who is 58, was managing director of the Ashington Coal Company and is a member of the advisory council of the Department of Scientific and Industrial Research, of the Geological Survey Board, and a number of other bodies.

Dr. Donald Burton has accepted the office of hon. treasurer of the International Union of Leather Chemists' Societies in place of Mr. W. R. Atkin (resigned).

Mr. Gordon Watson Douglas has been appointed director of research of the Australian Leather Research Association.

Mr. Anthony J. Wade, who has recently returned from the U.S.A., where he has been making a comprehensive study of American methods of electrical ceramic manufacture, has been appointed joint managing director of George Wade & Son, Ltd., High Street, Burslem, Stoke-on-Trent.

The board of Bamag, Ltd., has been strengthened with the purpose of widening the company's activities. The chairman of the new board is Lord Brocket and the other new members are Mr. Eoin C. Mekie, Mr. Alfred W. Newbery, and Dr. M. Steinschlaeger. Mr. B. Bregman and Mr. T. E. J. Hillman, who have been associated with the company for many years remain on the board.

Mr. N. F. Patterson, works manager at the Ruabon plant of Monsanto Chemicals, Ltd., has been appointed general manager of production. Mr. Patterson is a member of the Welsh Board for Industry, and chairman of the North Wales district committee. The new works manager is Dr. W. A. Hayward, formerly production manager at Ruabon.

Chemical Trade Golf

Many firms engaged in the chemical industry were represented in the Chemical Trade Golf Competition held recently at Sandiway.

G. T. Whithead (handicap 4) won the Sir John Brunner Challenge Cup with a net score of 70. The scratch prize was won by W. C. Welsh with 73.

The Rayner Memorial team prize was won by the team of Synthetic Ammonia and Nitrates with an average of 78.5. A. T. Dewar and W. N. Gill were the winners in the afternoon foursomes competition with a score of 2 up on bogey.

In the evening the competitors dined at Winnington Hall Club at the invitation of the directors of the Alkali Division of Imperial Chemical Industries, Ltd. Mr. W. M. Inman, Alkali Division chairman, presided and presented the prizes.

◆ OVERSEAS ◆

Higher Swedish Iron-Ore Shipments

During the first quarter of the current year, Sweden exported 2,021,000 tons of iron-ore, as compared with 1,812,000 in the same period of 1948.

Austrian Nitrate Record

The Linz Nitrogen Works is reported to have produced nearly 27,000 metric tons of ammonium nitrate in May, the highest output registered. Exports totalled 40,000 metric tons.

Austrian Steel Works' Record Export

The Schöller-Bleckmann steel works, Austria, are reported to have exported in May products valued at 12 million Austrian schillings. This figure establishes not merely a new post-war high, but exceeds also the average for the years 1920-38.

Swedens' First Electric Open Hearth

The first electric open-hearth furnace, forming part of the new steel plant of the Fagersta Works, Central Sweden, has lately been brought into operation. It has two giant 120,000-volt transformers and takes eight tons of scrap daily. A further plant to be completed at Fagersta next year, will cost Kr.20 million (about £1.38 million).

Free Disposal of Cocoa Beans

The international allocation of cocoa beans has been terminated by the International Emergency Committee of the FAO Council. This decision, which had effect on June 9, was based on the recommendation of the IEFC Committee on cocoa which had its headquarters in London. The committee was satisfied that current supply of cocoa beans is sufficient to meet effective demand.

French Ammonia and Fertilisers

The Société Industrielle et Financière de Lens is to extend its ammonia production capacity by constructing a second nitric acid plant and at the same time will proportionally increase its nitrate production. The company's report for 1948 shows that conditions were normal until October when, as a result of the strikes, there was a prolonged interruption in gas supplies which led to the loss of equivalent of two months' production. By the end of the year production had again resumed a satisfactory level. The price of fertilisers rose considerably in January and in October, 1948, and there is no immediate prospect that supply will outpace demand.

Hungarian Scientific Institutes

An institute of agricultural chemistry and an institute of forestry are to be established, according to a recent decree of the Hungarian Government.

New Dutch Fibre

Dutch textile experts are reported to have developed a new fibre from wool and nylon, called "Nylotex." Materials woven from this are said to be specially strong, crease-free and almost unshrinkable.

Standard Oil in Israel

The Standard Oil Company, of New Jersey, is to become a regular supplier of oil and oil products on the Israel market through a subsidiary company acquired last year, A. I. Mantacheff & Co., which has been operating mainly in Egypt, and to a smaller extent in Palestine.

Rhodesian Chrome-Ore

Chrome ore mined in Southern Rhodesia was largely increased in March as compared with February, output rising to 20,562 tons (valued at £75,518) from 16,101 tons (valued at £56,951). Total production for the first quarter of the current year did not, however, reach last year's level; 56,136 tons (£198,294) compared with 64,771 tons (£205,398).

U.S. Dutch Collaboration

A licensing agreement has, according to the *Algemeen Handelsblad,* been concluded recently between the Mechanite Metal Corporation (a U.S. firm) and the Globe-Ijzerindustrie, Tegelen, Limburg, Holland, under which the Dutch firm will be permitted to apply a patented process for the manufacture of high-grade cast iron, having a considerable degree of malleability.

Co-operative Research

Increasing co-operation with the Netherlands is one of the features noted in the annual report of the Belgian Institute for the Promotion of Scientific Research. While Dutch experts have been engaged in research on the establishment of steel quality coefficients at the Belgian Institute for Welding Technique, considerable sums were allocated to the Centre National de Recherches Metallurgiques, Department Henegan, for microanalytical investigations of steel and work on blast furnace control. The quality of barley and other products required for brewing are being investigated in collaboration with the Dutch Nacobrouw Institute.

New Synthetic Fibres

TWO new synthetic fibres, one derived from cottonseed protein, the other from chemically modified cellulose, have been produced experimentally by Government scientists at a U.S. Bureau of Agriculture and Industrial Chemistry's research laboratory in New Orleans, Louisiana.

The cottonseed-protein fibre is about 75 per cent as strong as wool when dry, feels soft to the hand, and has good dyeing characteristics. Its natural colour is yellow or light orange.

The second synthetic fibre is spun from sodium carboxymethyl cellulose (a soluble compound made from wood or cotton cellulose) and the salts of certain metals, including lead, copper, and aluminium. It is colourless or lightly tinted, depending on the metal used, and will dissolve in soapy water or other weak alkali solutions.

The metal-carboxymethyl-cellulose fibres are expected to find uses similar to those of the alginate fibres (made from alginic acid, a constituent of seaweed) now being produced in England, which are also soluble in weak alkali solutions. Alginate fibres have been found suitable for use as a spacing agent—to provide the so-called "missing threads"—in specially woven fabrics.

In the production of fibre from cottonseed protein, the process depends on a special acid treatment applied to the protein obtained from solvent-extracted cottonseed meal having a low oil content. The acid treatment is necessary because of the complex chemical make-up of the protein. Methods that are highly successful in preparing fibre from soya bean, peanuts, and other vegetable protein sources fail to produce cottonseed protein dispersions that can be spun. The new process changes the structure of the protein, corrects its tendency to jell or lump in untreated dispersions, and makes it suitable for spinning. So far as is known, this process, covered by U.S. Patent No. 2,462,933, is the first for treating cottonseed protein for this purpose.

In making metal-carboxymethyl-cellulose fibres, a solution of sodium carboxymethyl cellulose in water is extruded through a spinnerette into a bath containing the salts of one or another of several heavy metals. The possibility of spinning useful fibres in this way was discovered at the Southern Regional Research Laboratory during studies to increase the absorbency of cotton.

Parliamentary Topics

IN the House of Lords, Viscount Swinton moved an amendment to postpone the operation of the Iron and Steel Bill until October 1, 1950. He explained that the amendment was consequential on the decision taken the previous week to postpone the vesting date from May 1 to July 1, 1950. Viscount Addison, Lord Privy Seal, agreed that the amendment was consequential and it was agreed to. Other amendments, which have been inserted after Government defeats include the establishment of an Iron and Steel Prices Board, and the substitution of the value of assets for Stock Exchange prices as the basis of compensation.

* * *

THE question of university status of technical colleges was raised in the House of Commons last week by Mr. Ralph Morley, who asked the Minister of Education which colleges, under the recommendation of the Barlow and Percy Reports, would be selected. Mr. George Tomlinson replied that it was not at present possible to give the names, but he was asking the National Advisory Council on Education for Industry and Commerce to hasten its consideration of this matter.

* * *

DISMANTLING of German plant was again the subject of questions in the House of Commons last week. Mr. T. C. Skeffington-Lodge asked the Secretary of State for Foreign Affairs why a licence had been granted and a sum of 17 million marks was alleged to have been expended on improvements to the factory of the Gelsenberg Benzin Co. in the British zone, when this establishment was scheduled for destruction. Mr. C. P. Mayhew replied that the licence was of a temporary character only for the reactivation of that part of the plant necessary to process 15,000 tons of natural oil per annum.

* * *

THE Secretary of State for Foreign Affairs replying to Mr. T. C. Skeffington-Lodge and other members on the plan submitted by Herr Arnold, the German Land Premier, for retaining the August Thyssen steelworks, said the matter would be considered, but the proposals contained in the plan appeared to conflict with the recent inter-governmental agreements on reparations and industrial disarmament.

* * *

THE British-owned oil refinery at Haifa is not at present functioning, but His Majesty's Government is anxious to further its return to normal activity.—Mr. Hector McNeil.

CANADA'S HEAVY CHEMICALS

Record Production of Some Basic Supplies

THE importance of the Canadian chemical industry to the welfare of the Dominion is reflected by the increase in 1948 of heavy chemical production to a value of $71.5 million, 20 per cent more than was recorded in 1947.

A survey of progress in the industry has recently been made by M. McLeod, chief of the Mining, Metallurgical and Chemical Statistics, Dominion Bureau of Statistics, in a series of articles in *Foreign Trade*, in which the following basic data was included.

An average of 6294 workers was employed in heavy chemical production last year. The new caustic soda-chlorine works of the Aluminium Company of Canada, Ltd., at Arvida, Que., and the glycol works of the Dow Chemical of Canada, Ltd., at Sarnia, Ont., contributed substantially to the gain in output. The latter plant produces ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, dipropylene glycol, ethylene dichloride and dichlorethyl ether, all new products for Canada.

Mounting Yield of Acid

Sulphuric acid production in 1948 was the greatest on record, amounting to 679,448 tons of 100 per cent acid, of which about 75 per cent was used in the manufacture of fertilisers. Heavy chemicals, coke and gas, iron and steel, petroleum refining, explosives, textiles and metal refining were the other principal consuming industries in order of importance. The new contact acid plant of Canadian Industries, Ltd., at Hamilton, Ont., increased the capacity of the producing works to about 760,000 tons (100 per cent grade) yearly.

While complete details of production are not yet available, it seems likely that Canada's output of industrial and fine chemicals will total about $135 millions in 1948, subdivided by main classes (in millions) as follows: organic chemicals, $25; agricultural chemicals, $39; calcium compounds, $17; industrial gases, $16; sodium compounds, $12; acids, $10; and other chemicals, $16.

Imports of acids were valued at $3.3 millions in 1948. Carbolic, citric, stearic, tartaric, boracic, oleic, oxalic and chromic acids were the more important items. Imports of sodium compounds totalled $10.2 millions in value, principally phosphates, nitrate, glutamate, soda ash, caustic soda, cyanide, sodium base cleaning compounds, borax, chromate and bicarbonate.

The Canadian report recalls that production of fertilisers in Canada last year amounted to approximately 1,520,000 tons, comprising 650,000 tons of mixtures and 870,000 tons of nitrogen fertilisers.

Principally Nitrogen

The tonnage of superphosphates and other fertilisers in the over-all total was relatively small. During 1947 production amounted to 1,539,000 tons, of which 674,000 tons consisted of mixtures and 865,000 tons of nitrogen fertilisers. These include ammonium nitrate and calcium cyanamide, produced by the North American Cyanamid, Ltd., at Welland and Niagara Falls, Ont., ammonium sulphate, ammonium phosphate and ammonium nitrate, manufactured by the Consolidated Mining and Smelting Company of Canada, Ltd., at Trail, B.C., and Calgary, Alta., and ammonium sulphate recovered as a by-product from coke plants.

A factor revealing the very marked increase in output of mixed fertilisers in the Dominion is the comparison of the figures for 1920, 46,743 tons valued at $2,885,868, with the total of 650,000 tons valued at $22,332,000 in 1948.

Although volume of production was slightly lower than in the preceding year, the value of all fertilisers produced in Canada was 7 per cent higher than in 1947, amounting to $62.9 million, which compares with an output of $13.2 million in 1939.

Sales Record

Fertiliser sales in Canada were the highest on record, amounting to 672,171 tons for the 12 months ended June 30, 1948. While this represents an increase of only 2 per cent over the previous corresponding period, it is 100 per cent higher than in 1939.

Exports of fertilisers in 1948 amounted to $36.4 million, compared with a value of $34.4 million in the previous year. Shipments in the former year included 134,679 tons of phosphate fertilisers, 146,379 tons of ammonium sulphate and 411,081 tons of other kinds. About 75 per cent of the nitrogen fertilisers produced in the country last year was exported, shipments being made to over 50 countries.

Widespread Duty Exemptions

Chemicals and Instruments Affected by New Order

THE removal of Key Industry Duty from a wider range of chemicals than has been affected by any other recent exemption list is notified in an order made by the Treasury under powers conferred by the Finance Act. "The Safeguarding of Industries (Exemption) No. 5 Order, 1949," which is obtainable from HMSO (1d.), also makes some additions to the lists of chemicals concerned by earlier orders and replaces over 20 on the protected list.

The new exemptions are these:—

Optical elements:—

Analysers and polarisers consisting of a film of polarising material between glass discs or plates.

Magnifiers incorporating microscopic pictures.

Microfilm dutiable for its content of cellulose acetate.

Scientific instruments:—

Fermentographs for measuring and recording carbon dioxide evolved during dough fermentation.

Integrators (planimeter type).

Vacuum tubes:—

Sealed cylindrical X-ray tubes (four and two windows).

Compounds of rare earth metals:—

Celtium oxide, dysprosium oxide, arbium oxide, europium oxide, gadolinium oxide, holmium oxide, lutecium oxide, scandium compounds, terbium oxide, thulium oxide, ytterbium oxide.

Cerium sodium sulphate, crude.

Synthesis Products

Synthetic organic chemicals manufactured by fermentation processes:—

Acetamidosalol (acetylamido phenol salicylate), acid adipinic, acid butyric (normal), acid caprylic (*n*.octoic acid), acid diethyl acetic, acid dipropyl-malonic, acid filicic, acid formic (not less than 98 per cent), calcium ortho-iodoxy benzoate, acid maleic, acid malic, 2-ethyl hexoic acid, acid propionic, acid quinolinic, acid sebacic, acid succinic, excluding acid isosuccinic (acid methyl-malonic). Acyl derivatives of urea: Iso-amyl ethyl barbituric acid, sodium ethyl methyl butyl barbiturate, sodium iso-amyl ethyl barbiturate, sodium propyl-methyl-carbinyl allyl barbiturate. alcohol amido-ethyl, alcohol butyl secondary, alcohol capryl, alcohol dodecyl (alcohol duodecyl), alcohol isopropyl, containing not less than 0.5 per cent by weight of ketones, alcohol octyl, secondary normal (2-hydroxy-n-octane), alcohol propylene, aldehyde butyric (normal), allyl paracetaminophenol, amido-guanidine sulphate, meta-aminophenol, amidopyrin (dimethyl-amido-anti pyrine), ammonium perchlorate, amyl alcohol (isobutyl carbinol, not less than 98 per cent), barium manganate, isobornyl thiocyanoacetate, butyl methyl adipate. 2-3 butylene glycol, cellulose acetate, where the weight of the acetyl content, calculated as acetic acid, is not less than 55¼ per cent of the weight of the cellulose acetate, not being cellulose acetate which is an ingredient or forms part of a composite article, ethyl cellulose, chlor-nitrobenzol, ortho-, pentachlorphenol, cobalt arsenate, cocaine (crude).

Crystals, not optically worked, weighing not less than 2.5 gm. each, consisting wholly of one of the following: Barium bromide, B. barium chloride, barium fluoride, barium iodide, caesium bromide, caesium chloride, caesium iodide, calcium bromide. R. calcium chloride, R. calcium fluoride, calcium iodide, lithium bromide, lithium chloride, lithium fluoride, lithium iodide, R. magnesium oxide, potassium bromide, R. potassium chloride, potassium fluoride, potassium iodide, rubidium bromide. rubidium chloride, rubidium fluoride, rubidium iodide, sodium bromide, R. sodium chloride, sodium fluoride, sodium iodide.

Cumenol, pseudo-, methyl cyclohexanol methyl adipate, dichlor-hydrin, dicyandiamide, p-di-ethoxy ethenyl diphenyl amidine and its hydrochloride, diethyl amino-ethanol, diphenyl, diphenyl oxide, albon (cinnamoyl para-oxyphenyl-urea), epichlorhydrin.

Ethyl esters:—Ethyl abietate, hydrogenated ethyl abietate, ethyl acrylate, ethyl benzoyl-benzoate.

Ethyl phenyl-ketone (propiphenone), ethylamine, mono-, eukodal, furfurol, germanium oxide, glycol diabietate, glycol ethers, glycol ether esters (other than dibutyl glycol phthalate and dimethyl glycol phthalate). guanidin carbonate, guanidin sulphate, guanidin sulphocyanide, tetrahydronaphthalene, R. iron chloride, isophorone, iso-propyl-benzene (cumene, cumol), kryofin, laudirc chloride (lauroyl chloride), lipoiodin, maleic anhydride, R. mannite (R. mannitol), menthyl ethyl glycollate.

Mercury compound: N-(oxy-adeto-mercuric-propyl)-ethylurethane.

Methyl ethyl ketone, methyl esters: hydrogenated methyl abietate, methyl abietate, methyl acrylate, oxymethyl para-oxyphenyl benzylamine methyl sulphate. Methyl-sulphonal (diethylsulphonemethyl-ethylethylmethane, trional), *α*-naphthyl isothio-cyanate, nickel hydroxide.

Octyl esters: dicapryl phthalate, sodium dioctyl sulpho-succinate.

Organo-arsenic compounds: 4-oxy-3-ethylamino-phenyl arsinic acid N-methyl tetrahydropyridine *β*-carboxylic acid methyl ester.

Oxy-acetophenone, meta; phenetidine. ortho-; phenetidine, para: phenetidyl-phenacetin and its hydro chloride, phytin, piperazine (diethylene-diamine, dispermin), potassium ethylxanthogenate (potassium xanthogeante), R. potassium hydroxide, isopropyl hydrogen phosphate, safrol, sodium nitro-benzene sulphonate, sodium phenyl dimethyl pyrazolone amino methane sulphonate, sodium pyrophosphate, sodium triphosphate, penta-, styrol (stryrolene), succinic anhydride, sulphonal, theophylline, triecan-triamide, vioform (iodo-chloroxyquinoline), xenylamine, xylol, (meta), xylol (para).

Additions and Deletions

The order continues until December 31, 1949, the exemption from Key Industry Duty of all articles exempted by previous orders which expired on June 30, 1949, with these additions and deletions: Additions:-

Alcohol isoamyl (isobutyl carbinol) not less than 98 per cent: R. iron chloride; sodium triphosphate, penta. Deletions:—

R. acid carbolic, acid carbolic (synthetic), acid monol chloracetic, acid oxalic, acid phthane anhydride-alcohol butyl, normal, alcohol octyl (2-ethyl hexy, alcohol), R. benzo-phenol, benzo-phenol (synthetic), carbamide, cyclohexanol, cyclohexanol ester (dicyclohexyl phthalate), alkyl cyclohexanol ester (dimethyl-cyclohexyl phthalate). cyclohexanon, diethylamine (ethylamine, di-), ethyl ester (ethyl orthoformate), glycol ether esters (dibutyl glycol phthalate, dimethyl glycol phthalate). guanidin nitrate, methyl amidoxy-benzoate, methylene chloride, nitro-phenol (para-), octyl ester (dioctyl phthalate), R. phenol, phenol (synthetic), phthalic anhydride, sodium nitrophenate (sodium paranitro-phenol), triethanolamine, urea.

Israel's Potash

Collaboration of the U.S. Messer Chemical Construction Corporation is being given for the maximum exploitation of Dead Sea minerals, formerly worked by Palestine Potash, Ltd., the concessionaires. A yield of 70,000 tons of potash yearly is anticipated.

SCOPE FOR ENTERPRISE

Courtaulds System

THE comparative lack of opportunity for new enterprise in nationalised industries in contrast with the conditions prevailing in a free field is critically examined in the annual statement by the chairman of Courtaulds, Ltd., Mr. J. C. Hanbury-Williams. This is being circulated in anticipation of the annual general meeting on July 27.

"The system under which we and other so-called 'private' concerns operate is that of 'free enterprise,'" said Mr. Hanbury-Williams. "Our industry differs from the coal industry or the Post Office, in that anyone who can find sufficient people with money to back his ability is free to enter, whereas in nationalised industries it is a breach of the law to engage in them without licence from the Government monopoly.

"It follows that any person who thinks that he has discovered a new and better process, or product, or market, than we or any other existing undertaking in the rayon industry has discovered, is at liberty to commence business in our industry if he can find a sufficient number of people to take the same view. . . .

"The innovator may prefer to offer his project to us or to one of our existing competitors, but that does not alter the fact that he is free to do otherwise; with the consequence that we carry on our business in the knowledge that if we allow our productive efficiency to decline or fail to give the consumer what he wants at a price he is willing to pay, we invite competition and have inevitably to face it."

Adverse Balances

IT is by no means only nations that have to give out as well as take in. The rule applies to everyone. The man who is putting into the general pool of wealth the equivalent of £100 a year and taking out of that same pool a salary of £500 a year, is responsible for an adverse balance, quite as real and serious as the nation's present overseas deficit of £10 million a week. A round couple of million persons in the public employ should examine their own positions from this point of view. From the top to the bottom of this expensive Ministry (of Town and Country Planning) there is no one who can claim the credit for a pennyworth of export of any sort, kind or description, although together they consume some few millions of our impoverished imports.—SIR ERNEST BENN.

LAPORTE CHEMICALS

Group Earnings £583,336

THE 42nd annual report of Laporte Chemicals, Ltd., for the year ended March 31 shows a group profit of £583,336 (£433,278). Capital reserves now total £856,119 and revenue reserves £715,292. The directors propose a scrip bonus of 100 per cent. Consolidated current assets amount to £1,936,245 (£1,069,658).

In his address, the chairman, Mr. L. P. O'Brien, states:

As regards the future, undoubtedly there will be difficulties, but if we are left to manage our own affairs, we shall surmount them, and as far as one can reasonably foretell, the outlook is satisfactory.

Time to Speak Out

Hitherto, I have never referred to controversial matters, but on this occasion I feel impelled to do so. For many years your company has enjoyed good relations with the employees. Some of the employees belong to trade unions. How many owe allegiance to trade unions we do not know, but we believe it is a large number. We do not object to that situation, indeed, we recognise their position, and ourselves joined the Association of Chemical and Allied Employers so that, through the Joint Industrial Council, we could negotiate agreed rates of pay and conditions of labour. So far, so good, but now we hear that some trades union leaders are advocating the nationalisation of our chemical industry . . .

Your directors believe that nationalisation would work out disastrously for everyone concerned in our country, and meantime, while the threat is there, it will tend to destroy unity between employers and employees in chemical industry. It will deter from entering the industry the individual whom we wish to attract.

Developments in the British chemical industry are moving at a fast pace on a high scientific plane, and should not in normal peaceful times be hampered, as they would be, by bureaucratic control. Make it the business of everybody and it would become the business of nobody in particular, and progress would be retarded. It would follow that such matters as overseas developments, investments and patent applications would become matters of international bargaining.

In the circumstances, your directors feel that they should tell you that they reserve the right to take whatever legitimate steps seem reasonable to protect the interests of stockholders.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Ibex Petroleum Products, Ltd., London, S.W. (M., 9/7/49.) May 31, £2000 debenture, to D. M. B. Fitzgerald, London; general charge. *Nil. Dec. 9, 1947.

Modern Industrial Finishes, Ltd., Northfleet. (M., 9/7/49.) June 3, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. Dec. 31, 1947.

Petrochemicals, Ltd., London, W. (M., 9/7/49.) June 3, £1,800,000 secured on loan stock, secured by a Trust Deed dated May 17, 1949; charged on property, agreement for lease and certain shares as specified in schedule to Deed, and a general charge. *£1,300,000. Feb. 22, 1949.

Satisfactions

British Burmah Petroleum Co., Ltd., London, E.C. (M.S., 9/7/49.) Satisfaction June 3, of debenture stock registered Feb. 25, 1936.

Delaware Oil Co., Ltd., London. (M.S., 9/7/49.) Satisfaction June 9 of debenture registered May 5, 1941, to the extent of £40,000.

W. L. Lawler (Plastics), Ltd., Birmingham. (M.S., 9/7/49.) Satisfaction June 3, of charge registered Feb. 18, 1948.

Millom & Askam Hematite Iron Co., Ltd., Millom. (M.S., 9/7/49.) Satisfaction June 8, £200,000, registered August 15, 1935.

New Companies Registered

Alkin, Ltd.

Private company. (469,932). Capital £2000. Manufacturers of chemical plant and materials and electrical, laboratory and scientific furniture; chemical manufacturers, etc. Directors: J. E. W. Alderson and T. Kinahan. Reg. office: 276 Manchester Street, Oldham.

J. H. & A. Cole, Ltd.

Private company. (470,370). Capital £50,000. Objects: To acquire the business of a fertiliser and manure manufacturer. Directors: A. Cole, L. G. Davies, J. Watson, Mrs. K. Cole and C. F. Cole. Reg. office: 102 Feeder Road, Bristol, 2.

Bonnikson & Cronk, Ltd.

Private company. (470,271). Capital £1000. Manufacturing chemists, etc. Directors: J. G. Cronk, D. H. Cronk. Reg. office: 26 Waterloo Road, Epsom, Surrey.

Unisol Chemical Products, Ltd.

Private company. (470,167). Capital £2000. Manufacturers of chemicals, etc. Directors: R. F. Tilley, A. J. L. Ridge, S. E. Moss. Reg. office: 79 High Street, Walton-on-Thames.

Company News

The name of Maure Chemicals, Ltd., 9 Arundel Street, W.C.2, has been changed to Richard H. Kleeden, Ltd.

Chemical and Allied Stocks and Shares

STOCK markets opened the week cautiously, satisfaction with the outcome of the Paris monetary talks being overshadowed by the general tendency to await Sir Stafford Cripps' statement on the decline in our gold and dollar reserves and the reasons for the prevailing difficulties. At the time of writing, however, markets have steadied. British Funds have regained a small part of their recent heavy fall, and industrial shares appear to be taking their cue from gilt-edged.

Shares of chemical and allied companies have strengthened a little in some cases, with Imperial Chemicals at 43s. 9d., Fisons 44s., and Brotherton 10s. shares 20s. B. Laporte 5s. shares at 19s. have firmed up following the bonus news, and Albright & Wilson 5s. shares at 28s. 3d. kept steady, the decision of the latter company to postpone its big preference issue until general market conditions are more certain not coming as a surprise. Elsewhere, Amber Chemical 2s. shares were 6s. 3d. and Bowmans Chemicals 7s. Monsanto 5s. shares have changed hands around 30s. 7½d. Murex shares strengthened to 92s. 6d. in response to the decision to distribute a share bonus of 100 per cent.

Elsewhere, British Plaster Board 5s. shares rose to 21s. in response to the bonus and financial results which exceeded market expectations. Associated Cement improved to 72s. United Molasses firmed up to 37s. 6d., Dunlop Rubber to 62s. 9d., British Glues 4s. have been firmer at 17s. 9d.; while British Match rallied to

32s., the results coming as a pleasant surprise to the market. In other sections, Borax Consolidated deferred eased to 50s., British Aluminium were 43s. 3d. and British Oxygen 91s. 6d., after touching 90s. De La Rue rallied to 26s. 9d., while Lever & Unilever were 44s. 7½d. Turner & Newall improved to 72s. 3d. and Triplex Glass 10s. shares have been more active around 18s. 9d. partly on market talk of prospects of a bonus of some kind. Elsewhere, Tube Investments changed hands up to £5¾. British Xylonite were 66s. 3d., Ilford at 19s. 3d. were "ex rights" to the new shares. General Refractories were 23s. 4½d. and Amalgamated Metal shares 17s. 6d.

Iron and steels have at the time of writing also participated in the better tendency in markets. As in most other sections, this was due to the appearance of a few buyers and cessation of the selling in evidence in recent weeks. It is realised, however, that the main trend governing markets will be the reaction to Sir Stafford Cripps' statement on the implications of the gold and dollar losses suffered in the past three months; and these notes are being written before the Chancellor's speech. Nevertheless, iron and steel shares are being favoured on the ground that nationalisation may never happen. United Steel, Dorman Long, Colvilles and Stewarts & Lloyds have therefore participated in the better trend. In other directions Staveley were 77s. 6d. and Powell Duffryn have firmed up to 26s. 9d. Guest Keen rallied to 38s. 6d. and Babcock & Wilcox at 59s. 6d. have also regained part of the fall in price which followed the new issue news.

Boots Drug rallied to 48s. 9d. in advance of the full report and accounts and the chairman's annual statement. Beechams deferred were 11s. 3d. and Sangers 28s. 7½d. Oil shares showed irregular movements. Anglo-Iranian were unresponsive to the great financial strength of the accounts and high earnings last year, but C. C. Wakefield responded to the 300 per cent share bonus announced by the company.

British Chemical Prices

Market Reports

ACTIVE conditions have again been reported from most sections of the industrial chemicals market and a fair amount of new business has been put through. Inquiries for export continue to be prominent and there are hopes that the satisfactory export totals for May will be maintained. The awaited revision of prices for acetic acid and acetic anhydride have now been announced, the chief alterations being: commercial glacial acetic acid £70 per ton for contract quantities and acetic anhydride £100 per ton for 10-ton contracts. Magnesium chloride is reported to be £1 per ton cheaper at £17 5s. per ton. The week has produced no special features to record, but a steady improvement in the supply position has been noticeable in most directions. In the coal tar products market trade has been comparatively quiet and for most products the available supplies are sufficient to take care of requirements. A fair export business in pitch is reported at competitive prices.

MANCHESTER.—Allowing for continued holiday influences, which are affecting the movement of supplies into actual consumption, fairly active trading conditions have been reported on the Manchester market for both light and heavy chemicals during the past week. There is a steady demand from domestic users for caustic soda and other alkalis, and also for the ammonia and potash compounds and a wide range of miscellaneous chemicals, while business on export account has been on a fair scale. Apart from the reductions in acetic acid and acetic anhydride, there has been little fresh movement of prices. In the tar products market business has been relatively quiet in most sections, though there is a fair call for carbolic acid and most of the light distillates.

GLASGOW.—There has been little change in the Scottish chemical market and general conditions are noticeably quiet. This will probably have some effect on the turnover of chemicals in the course of a week or two. There has been increased interest in recent weeks in borax for weed-control. There has also been a heavier buying of plating salts. The consumption of formaldehyde in Scotland continues to increase. In the export market negotiations are in progress, particularly with Argentinian buyers.

ERP and Italian Plastics

In view of the large distribution of polyvinyl chloride (valued at $2.5 million), proposed under the ERP scheme, the Italian Chemical Association is endeavouring to procure a more rational distribution of licences. Authorities are expected to give the matter favourable consideration, as plastics made in Italy are now of high quality and produced at competitive prices. Home factories are stated to be capable of producing 1800 tons a year.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Processes for the recovery of riboflavin.—Commercial Solvents Corporation. May 28, 1943. 621,552.

Production of fluorocarbons.—I.C.I., Ltd., and N. F. Sarsfield. July 19, 1943. 621,555.

Induction heating apparatus.—Induction Heating Corporation. Dec. 26, 1942. 621,725.

Lead chambers for manufacture of sulphuric acid.—A. M. Fairlie. March 17, 1944. 621,892.

Basic aluminium chloride.—W. R. Warner & Co., Inc. Dec. 31, 1943. 621,672.

Dispersion or dissemination of insecticides, fungicides, weed-killers and the like.—E. W. Bateman, and W. Fletcher. Jan. 8, 1945. 621,732.

Dispersion or dissemination of insecticides, fungicides, weed-killers or the like.—E. W. Bateman, and W. Fletcher. April 30, 1945. 621,894.

Coating processes and apparatus therefor.—British Thomson-Houston Co., Ltd. May 11, 1944. 621,734.

Production of 1:5-pentanediol.—I.C.I., Ltd,. J. G. M. Bremner, and F. Starkey. May 25, 1945. 621,735.

Methods of making curved iron cores for electromagnetic induction apparatus.—British Thomson-Houston Co., Ltd. June 1, 1944. 621,676.

Thermoplastic composition.—Austenal Laboratories, Inc. May 20, 1944. 621,845.

Laminated products and methods of making them.—G. F. Rayner. (Sylvania Industrial Corporation.) July 18, 1945. 621,950.

Means for heating insulating material prior to the working thereof.—British N. S. F. Co., Ltd., and K. G. Smith. July 19, 1945. 621,783.

Manufacture of polyvinyl acetal resins.—Shawinigan Chemicals, Ltd. Aug. 19, 1944. 621,784.

Manufacture of heat cast refractories.—Corning Glass Works. Aug. 1, 1944. 621,736.

Apparatus for the pulverisation of liquids in the form of aerosols.—Soc. Anon. Teco. July 27, 1943. 621,785.

Refractories.—C. Smith, W. E. Smith, and D. E. B. Green-Smith. Aug. 23, 1945. 621,737.

Drying oils.—Bakelite, Ltd. Dec. 14, 1944. 621,953.

Cements containing a hydrolysable organo-silicon compound and refractory objects prepared therewith.—N. Evans. H. G. Emblem, C. Shaw, and W. E. Smith. Nov. 28, 1945. 621,740.

Apparatus for recovering water soluble metallic salts in waste plant effluents or spent process liquors.—Firestone Tyre & Rubber Co. Dec. 13, 1944. 621,741.

Condensation-polymerisation products of silicon ortho-esters.—B. Gluck, W. E. Smith, and C. Shaw. Feb. 2, 1946. 621,742.

Production of furfuryl alcohol.—I.C.I., Ltd., D. G. Jones, J. G. M. Bremner, and R. K. F. Keeys. Feb. 26, 1946. 621,743.

Hydrogenation of cyclic organic compounds.—I.C.I., Ltd., and D. G. Jones. Feb. 27, 1946. 621,744.

Catalysts and their use.—I.C.I., Ltd., and P. W. Reynolds. May 3, 1946. 621,749.

Method and apparatus for the continuous crystallisation in vacuo of sugar solution and the like.—G. L. Williame. Sept. 30, 1941. 621,797.

Method of preparing hexachlorobenzene.—J. Dorleijn. May 29, 1946. 621,962.

Agglomeration processes, applicable to ceramic materials or the like, and products resulting therefrom.—Soc. Française Radio-Electrique. July 17, 1945. 621,602.

Process for decreasing the swelling-value and for increasing the acid-resistance of casein-threads and of fabrics made therefrom.—N.V. Onder-Zoekingsinstituut Research. Sept. 7, 1945. 621,753.

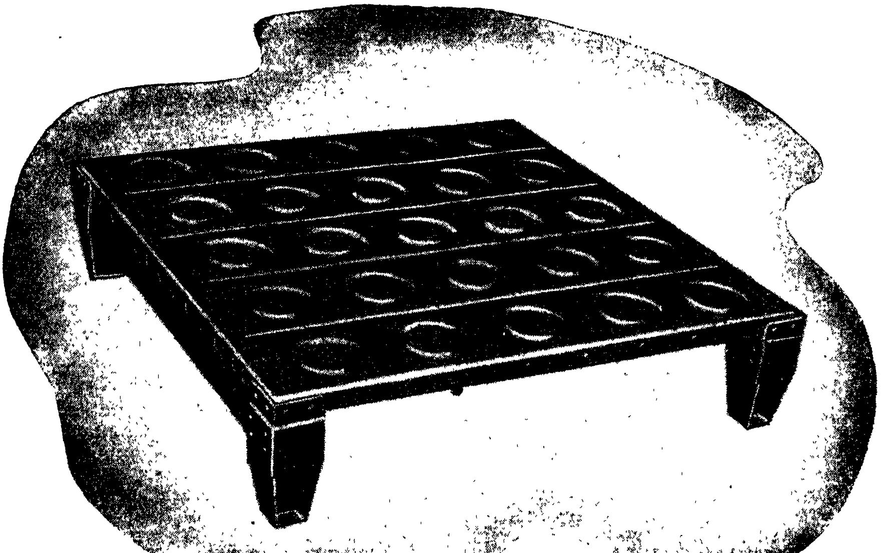
Process for the extraction or recovery of oil and other products from herring and other fish.—J. H. Jenssen, N. W. Bye-Wiers, and P. O. Skjeslien. [trading as Konsortium Apoteger D. A. Hansens Sildeforedlingsmetoder]. March 22, 1941. 621,877.

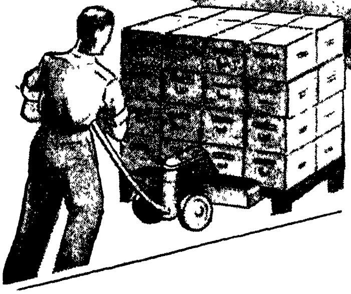
Process for the catalytic synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.) Aug. 23, 1946. 621,902.

Thermo-hardenable organo-silicic resins.—Soc. des Usines Chimiques Rhone-Poulenc. July 27, 1946. 621,883.

Resin-like copolymers.—C. Arnold. (Standard Oil Development Co.) Oct. 28, 1946. 621,703.

Process of preparing penicillamine disulphides.—Merck & Co., Inc. Dec. 20, 1945. 621,915.





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Manufacture of α-substituted formylamino-malonic esters and α-amino carboxylic acids and derivatives thereof.—Roche Products, Ltd., A. Cohen, E. G. Hughes, and J. A. Silk. Nov. 13, 1946. 621,706.

Manufacture of derivatives of oxazolidine-2 : 4-dione.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. Feb. 19, 1947. 621,644.

Method of carbonisation and activation of granulated or pulverulent carbonaceous materials.—Compagnie Industrielle de Procedes et d'Applications Soc. Anon. Aug. 15, 1946. 621,942.

Apparatus for obtaining a combustible gas by fermentation of organic materials. —G. L. R. Ducellier, and M. A. Isman. Jan. 22, 1943. 621,771.

Production of stainless steel.—W. W. Triggs. (Alloy Research Corporation.) Dec. 28, 1944. 622,194.

Process for forming water-insoluble layers from colloids on the surfaces of materials and for making dry preparations for use in the said process.—N.V. W. A. Scholten's Chemische Fabrieken. Arpil 25, 1941. 622,208.

Method of and apparatus for purifying raw water from humic substances.—A. M. R. Karlstrom. April 12, 1946. 622,282.

Apparatus for growing crystals.—Western Electric Co., Inc. June 11, 1945. 622,113.

Agglomeration processes, applicable to ceramic materials and the like, and products resulting therefrom.—Soc. Française Radio-Electrique. July 17, 1945. 622,117.

Alkyd copolymers.—Wingfoot Corporation. March 5, 1946. 622,235.

Preparation of organo-silicic oils.—Soc. des Usines Chimiques Rhone-Poulenc. June 28, 1946. 622,129.

Polythene compositions.—E. I. Du Pont de Nemours & Co. Nov. 3, 1945. 622,252.

Process for removing metal oxides or metal salts from heavy metal surfaces and cleaning preparations therefor.—Ciba, Ltd. Feb. 8, 1946. 622,316.

Methods of preparing hydrocarbon-substituted silanes.—British Thomson-Houston Co., Ltd. March 1, 1946. 622,323.

Catalytic oxidation of hydrogen sulphide in gaseous mixtures.—Gas Light & Coke Co., R. H. Griffith, and W. B. S. Newling. March 1, 1947. 622,324.

Photo-polymerisation of compounds containing the ethylene double bond.—E. I. Du Pont de Nemours & Co. March 16, 1946. 622,374.

Process for the manufacture of C-nitrosoarylamines.—General Aniline & Film Corporation. May 1, 1946. 622,388.

Desulphurisation of molten ferrous metal.—F. C. Potts. (Linde Air Products Co.) March 21, 1947. 622,419.

Electrolytic process and apparatus.—H. London, and E. V. Appleton. Sept. 14, 1942. 622,724.

Process of recovering sterols and like cyclopentanophenanthrene compounds.—American Cholesterol Products. Sept. 12, 1939. 622,725.

Apparatus for producing a zone of disrupting atoms.—H. Smith. Nov. 5, 1948. 622,636.

Apparatus for measuring the output of fluids.—Soc. Anon. de Distribution du Gaz (Distrigaz). Oct. 11, 1940. 622,640.

Dehydrochlorination of chlorinated hydrocarbons and distillation of resulting compounds.—Solvay & Cie. Oct. 13, 1943. 622,642.

Manufacture of organo silicon compounds by the Grignard reaction.—A. E. Meadowcroft, C. Shaw, and W. E. Smith. Feb. 13, 1946. 622,463.

Processes for separating solid and liquid triglycerides from each other.—A. H. Stevens. (Emery Industries, Inc.) Feb. 14, 1946. 622,735.

Retarding the solution of water soluble fertilising salts.—G. E. Heyl. Feb. 14, 1946. 622,464.

Electric measuring instruments for measuring the moisture content of materials. —Marconi Instruments, Ltd., C. F. Brocklesby, and W. A. H. Todd. April 16, 1946. 622,470.

Preparation of oil-soluble phenolic resins.—Bakelite Corporation. May 29, 1945. 622,657.

Method and apparatus for treating liquids containing suspended solids.—Infilco, Inc. Oct. 26, 1942. 622,474.

Method of increasing the high temperature strength of heat-resisting alloys.—Allegheny Lullum Steel Corporation. Dec. 28, 1943. 622,741.

Thermal treatment of aluminium base alloys.—Aluminum Co. of America. Dec. 31, 1942. 622,660.

Production of poly (methyleneamide) resinous condensation products.—L. Berger & Sons, Ltd., H. J. Tattersall, and L. E. Wakeford. July 12, 1946. 622,743.

Interpolymers and moisture-proof sheet wrapping material coated therewith.—E. I. Du Pont de Nemours & Co. July 14, 1945. 622,481.

Process for the production of polymerisation products.—Distillers Co., Ltd., C. A. Brighton, M. D. Cooke, D. Faulkner, J. J. P Staudinger, and D Cleverdon. July 18, 1946 622,482.

Methods and apparatus for producing cellulose xanthate.—American Viscose Corporation. Feb. 7, 1946. 622,746.

The Chemical Age

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Mineral Wealth—Or Poverty?

THE dependence of chemical industries upon mining and metallurgy for a large part of its supplies is one of the basic principles which are too familiar to receive much serious attention. It is appropriate, therefore, that the fourth Empire Mining and Metallurgical Congress in London and other parts of the country this week has riveted attention upon the decisive character of the work being done by British mining engineers and metallurgists both here and in the many varied mining areas of the Commonwealth and Empire.

No one could doubt this new awareness who witnessed the impressive gatherings which have assembled at London's Guildhall on Monday for the Congress banquet, distinguished by the presence of the Duke of Gloucester, and the subsequent meetings in other parts of the country. The character of this support is the best evidence of the heightened recognition of the importance of improved technology in winning and making the best use of all the multiplicity of minerals within the Commonwealth. The gathering in the Guildhall was capable of being mistaken for a United Nations assembly, bringing together as it did some of the foremost workers in the mining and metallurgical fields in each of the British countries, those of Western Europe and the U.S.A., under the presidency of Sir Henry Tizard, whose leadership in what is being done in Great Britain to extend our resources by scientific means enables him to speak with special authority. He has, moreover, seen much of the work being done around the world to make minerals available for industry and, what is perhaps equally as important at the moment, has a clearer perception than most of the rate at which these vital reserves are being expended.

He gave a salutary reminder of this factor in the course of his presidential address to the Congress. "Everyone," he said, "knows that coal and iron are essential to our modern civilisation. Not everyone knows the great importance of the rarer metals, the names of some of which they would hardly recognise. Indeed, the whole of our material civilisation depends on drawing on the capital resources of the earth. We discover the places where Nature has concentrated minerals in a way that we do not understand; we extract them, we concentrate them and refine them still further, and then dissipate them completely in use. That process obviously cannot go on for ever. For how long will it go on? We have reached the stage where this question is not of academic interest

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only; it is rapidly becoming one of real practical importance.

"In my lifetime more irreplaceable minerals have been dissipated than in the whole previous history of the world. The rate of consumption goes on increasing, and no one is going to put a limit to the rate. No one can be certain, from existing knowledge, that some of the metals on which so much depends, such as lead and tin, will be available in sufficient quantity in a hundred years' time. . . . Broadly speaking, it is true to say that the rate of discovery of minerals of economic importance has been pretty steadily going down for 20 or 30 years. . . . Many people will pooh-pooh the suggestion that many mineral deposits will be exhausted within 100 years. They will say, and rightly say, that such stories have been told before, and have been proved false by events."

Uncertainty is, in short, the keynote of the present situation facing those who seek to create firm estimates of what is the total store of some of the most indispensable materials and what period will elapse before that store is empty. To make confident prediction even more difficult, future rates of consumption are also unknown factors which advances in fundamental knowledge and changes in technical processes can transform out of all recognition. It is happening already, and the still uncharted potentialities of nuclear physics seem capable of accelerating that process in startling fashion. Predicting that our coal reserves may last "at least another 1000 years," Sir Henry Tizard foresees that within that time even the rarer metals may come by synthesis from other elements (platinum to gold is a current, expensive possibility). But what may not happen in the interval?

Because much of the evidence available bearing upon the prolongation of these vital supplies is of a conflicting character, and has so often disproved all the forecasts, Sir Henry Tizard wisely refrains from assuming the rôle of a prophet. He has, however, made clear to the congress that, whatever is the truth about these subterranean resources, no acceptable solution of the problem of supplying rapidly changing needs, now and in years to come, will be reached without the fullest collaboration of scientists of many kinds. The challenge now is no longer to mining geologists and engineers alone, and it cannot safely be ignored.

Notes and Comments

SCI in Manchester

THE ability of the Society of Chemical Industry to procure the willing collaboration of chemists in many countries has been apparent again in Manchester this week, where that organisation has been holding its annual general meeting—the 68th. Like the concurrent fourth congress convened by the Empire Council of Mining and Metallurgical Institutions, with which it has a good many points of common interest, the society has had gratifying evidence this week of its continued capacity to rally members and distinguished collaborators from most quarters of the globe when it holds its major assemblies. The most obvious example of this has been the very welcome return of the president for 1948-49, Sir David Rivett, whose responsibilities as chairman of the Australian counterpart of our Department of Scientific and Industrial Research normally enforce a separation of some 13,000 miles. His presence, however, was only one of the proofs of the growing international standing of the SCI, which was reflected also in the considerable proportion of speakers and auditors from overseas and in the award on Wednesday of the Society's 1949 Medal to Dr. Foster Dee Snell, the New York consulting chemist and chemical engineer. This medal is conferred once in two years for conspicuous services to applied chemistry " by research, discovery, invention or improvements." The election of Mr. Stanley Robson to succeed as president Sir David Rivett, for whom he has so frequently deputised, was announced this week.

Capricious Copper Prices

FOR a few days this week customers of the Ministry of Supply had the unaccustomed privilege of being in almost as favourable a position as American users of some basic metals. By the very welcome reduction of the Ministry's prices electrolytic copper, pig lead and zinc were brought approximately to parity with those supplies in the U.S.A., if one excluded the substantial additions here for freight charges. That happy position prevailed for about three days. Then the upward trend in American nonferrous metal prices, of which there had been easily recognisable signs, upset the short-lived equality. The U.S. price for electrolytic copper jumped to 17⅝ cents per lb., with the result that the Ministry's price tickets had hastily to be changed. Copper, cut by £13 10s. per ton a few days before, was raised again to the extent of £3 10s.—to £107 10s. Consumers have ruefully observed that this was the swiftest adjustment to an American price change on record. That sensitiveness to changes in the transatlantic market has not been noticed when markets were falling. Has the Ministry, by chance, also observed that American lead prices too, were becoming perceptibly firmer this week?

Dramatic Interlude

INDUSTRIAL chemistry does not dramatise itself; all the evidence points in the opposite direction. Yet some of the processes by which the prosaic products of the industry are made are replete with possibilities which call for something more than technology and training can confer. Examples of this super quality occasionally come to light, usually belatedly, revealing outstanding courage and devotion to duty, the need for which is always present where some processes are carried on. An incident of this kind, which occurred last December, is, for once, described in something approaching its true dramatic context in the report of the recent 27th meeting, in Blackpool, of the I.C.I. Control Works Council. The story is told in the current issue of the *I.C.I. Magazine*. The principal figure was Mr. J. D. Leech, shift foreman of the ammonia synthesis plant at the I.C.I. Billingham works, to whom was awarded the company's bravery medal, "for exemplary devotion to duty, outstanding courage and extraordinary presence of mind in most difficult and dangerous circumstances." Regardless of his own safety, Mr. Leech tried to trace and isolate a leak of gas—at the high pressure of 250 atmospheres—which had suddenly developed at one end of his plant building. His 20 years' experience can have left him in no doubt of the risk he accepted when, having found it impossible to distinguish in the dust storm which had developed the pipe in the complex equipment from which the gas was escaping, he switched on the general alarm—and remained to do what he could to reduce the risk of a heavy explosion. He was in fact caught in the centre of the explosion, but he stayed close to the subsequent fire to isolate and blow down the near-by high pressure equipment, so as to prevent further gas leakage. He kept full control of the situation until the arrival of help, although badly shaken. The I.C.I. "citation" notes that Mr. Leech minimised the damage, so that there was little loss of ammonia or methanol production. That, however, is manifestly not the most important moral to be drawn from this heartening sidelight on industry.

Chemists and the BAC

FEW activities have changed their aspect so profoundly or so quickly as contemporary chemistry, which today requires of its practitioners a greater flexibility of mind than does almost any other calling. Yet chemists as a body are harder to convert than some admitted reactionaries. The predominant evidence is the immutable indifference which chemists have maintained for more than a decade in the face of numerous good arguments why they should actively collaborate in the practical work of the British Association of Chemists. The latest of a long series of appeals which has been addressed to chemists on this subject is made in the principal article in *The British Chemist*, the new and improved form of the association's journal—which has been run at a loss, although all that it contains is of intimate concern to chemists. The current appeal for wider backing for "the only trade union catering exclusively for chemists" does not disguise the fact that the interests shown by the majority of chemists falls short of attending meetings—of which some held recently in collaboration with the Royal Institute of Chemists should have appealed to all of them—and questionnaires are useless. So few respond. The journal points to a great variety of ways in which the BAC could render valuable service to chemistry and to chemists, but all are conditional upon a heightened measure of support, of which there are at the moment no very encouraging portents.

Dislike of Group Control

AT a time when trades unionism has gained a wider hold than ever before it is curious to observe that chemists' reluctance to have their affairs administered by a central authority appears to be as strong as ever it was. That was reflected in a different connection by the coolness shown towards the Government-sponsored central technical register. The fact that the BAC is qualified to perform functions beyond the scope of any ordinary trade union does not appear to have converted many from their dislike of the possibility of control by a group. Meanwhile, the sympathy which must be felt for the BAC in the frustration of some of its well-intentioned efforts may be tempered with respect for this preference by chemists for individualism. The BAC, which is almost as remote from Transport House policies as any organisation of that kind can be, seems, however, undeservedly to have been condemned to repeated discouragement in its self-appointed rôle as a guardian of professional interests in such relatively uncontroversial spheres as chemical education and public relations. It remains, however, the custodian of an unemployment fund of some £48,000, on which, it is agreeable to note, so few demands are made that it is now five times as large, per member, as the equivalent fund of the Medical Defence Union.

BRITISH BASE METALS

Need to Re-Create a Free Market

A COMPREHENSIVE survey of the progress of the British Non-Ferrous Metals Federation was given by the retiring president Mr. Horace W. Clarke, in his report to members at the recent annual general meeting.

It was to be regretted, the president said, that four years after the end of war affairs were such that the Government continued to be sole purchasers of the raw materials, the single arbitrator of price, and only source of supply.

"As you all know," he said, "we have to-day no freedom to buy our raw materials where we please. We are compelled to purchase from the Ministry of Supply at the price which they themselves fix—a price which is to-day some £30 a ton above the world price."

"We have from the outset taken the initiative in pressing the Government to reduce its price to the world level, and since the period at the end of April, when the American price began to fall rapidly, there have been two substantial reductions in the Ministry of Supply price for copper and other virgin metals. I think it is fair to say that these reductions were largely due to the activities of the federation." (*Further reductions made this week are reported on page 78*).

"End Bulk Purchase"

The re-opening of the London Metal Exchange, continued the speaker, would be welcomed by the federation, subject to proper safeguards and certain modifications of pre-war practice. The federation considered that the time had now come to end the practice of bulk purchase, and return to conditions of a free market.

The International Conference of Non-Ferrous Metal Manufacturers, formed in 1946, continued to make satisfactory progress and Mr. Roland Finch had been re-elected president.

The monthly bulletin, prepared and published by the statistics department of the federation, had achieved world-wide success.

The importance of research and scientific work was fully appreciated by the federation, and substantial support had been given to the British Non Ferrous Metals Research Association, of which all federated associations and federated firms were automatically collective members.

The problems of combining administrative ability and the necessary technical knowledge were being tackled by the training and education sub-committee of the federation under the chairmanship of Mr. Arthur Johnson.

The president concluded by saying that a strong and representative team had been selected to visit the U.S.A. under the scheme organised by the Anglo-American Productivity Council, and it was expected that much useful knowledge would be gained.

(*Continued at foot of next column*)

LONDON METAL EXCHANGE

No Free Market

HOPES that the many representations that have been made in favour of reopening of the London Metal Exchange might now have produced a change in Government policy were dissipated this week, although the possibility that a freer system of distribution of tin appeared to have been improved. (A slight reduction in tin prices, to £553 10s. per ton, was recorded in Malaya this week.)

The decision affecting the London Metal Exchange was given by Mr. G. Strauss, Minister of Supply, in the House of Commons on Monday. Replying to several questions, Mr. Strauss said he had carefully considered commercial and industrial representations on the advantage of re-opening the exchange, in particular the hedging facilities which that would provide.

It was, however, generally accepted that a free market in non-ferrous metals would have to be severely restricted to prevent a loss of dollar resources, and he was convinced that those limitations, if they were to be effective, would so restrict the freedom of the market as largely to nullify the benefits which its advocates desired to bring about. Even more important, the abandonment of bulk buying of those commodities from Commonwealth countries would seriously endanger our supplies from those sources and make us more dependent on dollar purchase.

For those reasons he was at present unable to agree to the re-opening of the Metal Exchange for the purchase and sale of copper, lead, and zinc. Other considerations applied to tin, which was now the subject of international discussion. He had not reached any conclusion about the future marketing of tin.

Questioned further if he would make base metals available at world prices, Mr. Strauss said new prices were being fixed for copper, lead, and zinc, which would bring them on a par with prices in the United States. (*Page 78, this issue.*)

Further Reduction of Base Metal Prices

Disparity of British and American Rates Reduced

PRICES of copper, lead and zinc in Britain have been reduced as from July 12.[*] The Ministry of Supply, in a note this week, states that the reductions in the selling prices, taking into account freight, delivery charges and other factors, bring home prices for these metals into line with those current in the U.S.A.

The Ministry of Supply observes that the Exchequer will have to bear a loss, the size of which depends on how future price movements affect values of stocks in hand. Because of the present unstable nature of the market in non-ferrous metals, the Ministry has, for forward purchases, instituted a new arrangement, under which users can continue to buy forward up to six months' requirements for copper and zinc, and three months in the case of lead. The buyer will, however, have to pay a premium as an insurance against a rise in prices.

The new prices and the previous prices (per ton delivered) are:—

	New price		*Old price*	
	£	s.	£	s.
Electrolytic copper	104	0	117	10
Good soft pig lead	75	10	82	0
Good ordinary brand zinc	58	0	78	0

Discounts and premiums remain unchanged.

The Ministry's buying price for rough copper in slabs of from 2 cwt. to 3 cwt. is reduced from £80 to £70 per ton. The prices of zinc oxide are also reduced to the following figures for lots of not less than 2 tons, delivered to the buyer:

		New price £ per ton			*Old price* £ per ton	
Red Seal	58	15	0	75	15	0
Green Seal ...	60	5	0	77	5	0
White Seal ...	61	5	0	78	5	0

Licences to acquire copper and zinc will now be granted only against: (1) A declaration that the metal is required to cover orders; (2) a declaration that in the case of applications for virgin metal full allowance has been made for the expected intake of scrap; (3) the usual purchase order on the Directorate of Non-Ferrous Metals, giving details of specification, delivery, etc., required, or a statement that the applicant intends to purchase from a stockist.

This means that the condition—suspended on June 1—that applications for licences had to be accompanied by a signed declaration that the metal was required to cover orders, is now reimposed. The period of validity of the licences remains unaltered.

Additional charges ranging from £2-£4 per ton will be made on orders booked for forward delivery.

Orders for copper and zinc will not be accepted for delivery more than six months after the end of the month of order, or for lead for more than the period of the quota (at present three months) under the rationing scheme. Sales for delivery in any one calendar month will be limited to a quantity which does not exceed, or does not substantially exceed, the customer's normal monthly consumption.

UNIVERSITY WILL HELP SCOTTISH MINERAL RESEARCH

THE Scottish Council (Development and Industry), is to have the collaboration of Glasgow University in one of two investigations this summer into the mineral resources of Scotland. Eight students of the university have been chosen to assist in the investigation, which will be devoted primarily to the location and examination of deposits of talc, dolomite, feldspar, and serpentine. The Scottish Council has agreed to grant money to permit the students to undertake work of a wider nature than would otherwise be the case.

Among the areas to be prospected are the Shetland Islands, the Highlands, and the Western seaboard.

Discussing the investigation, Mr. W. S. Robertson, Scientific Contacts Officer, said that more precise information was required than had been afforded by previous surveys. In the case of dolomite, employed by steelmakers, the exact constitution of any individual deposit was of primary importance. It was thought possible that dolomite might also be used as a source of magnesium.

Another investigation sponsored by the Scottish Council will be a survey of the stone-building industry, with a view to establishing the reasons for the considerable price difference between stone and brick houses.

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[*] The further adjustment of the Ministry's price for electrolytic copper, in response to the rise in the U.S. price, to £107 10s. per ton is referred to in "Notes and Comments" (page 75, this issue)

BID TO DISINTEGRATE DU PONT

U.S. Attack on Largest Chemical Producer

SEEKING to dissolve what has been termed "the largest single concentration of industrial power in the United States," the U.S. Attorney General last week filed a sweeping anti-trust suit in the Federal District Court, Chicago, on behalf of the Department of Justice. In addition to more than 100 individuals, including leading members of the du Pont family, the principal corporate defendants are E. I. du Pont de Nemours and Co., Inc., the General Motors Corporation, of Detroit, Michigan, the United States Rubber Company, of New York, and the Christiana Securities Company and Delaware Realty and Investment Corporation, two holding companies of the du Pont family.

The civil action aims to break up the $1588 million du Pont organisation, which includes a $560 million investment in the General Motors Corporation. The du Pont organisation dates from 1802 when Eleuthere Irenee du Pont borrowed $36,000 to make gunpowder.

Share Disposal Objective

The chief objective of the suit, which has required more than 18 months' preparation, is to secure the disposal by du Pont of its 10 million-share investment in the General Motors Corporation, which represents 23 per cent ownership and affords virtual control, since the remaining 34 million shares are spread over about half a million stockholders in small lots. The Government also wants the du Pont family to sell all its holdings in the U.S. Rubber Company, in which it holds 17 per cent of the shares.

Other objectives of the Government are to enforce the sale by du Pont of its business of making tetraethyl lead, ethyl fluid and ethyl chloride; the sale by General Motors of its 50 per cent stock interest in the Ethyl Corporation, which makes "anti-knock" fluid for blending with motor spirit; the sale by du Pont and General Motors of their interests in Kinetic Corporation, a manufacturer of refrigerants; the cancellation of all existing contracts between du Pont, General Motors and the U.S. Rubber Company relating to the sale of products, the grant of licences, agreements to license under patents, and agreements providing for the exchange of technical information.

Charging the companies with combining and conspiring to violate the Sherman and Clayton act in the "development, production, manufacture, distribution and sale" of their products, the Government's 65-page complaint contains charges that the units of the group maintained restricted agreements, excluding outside suppliers, and employed preferential price scales among themselves, that they exchanged patents and technical information on an exclusive basis, eliminated competition and formed jointly owned subsidiaries, such as the Kinetic Corporation.

Three Largest Manufacturers

According to the Government, the du Pont enterprise is the nation's largest producer of explosives, powder and chemicals, General Motors is the nation's largest manufacturer of automobiles, trucks. and railroad diesel engines, and "the largest manufacturing company in the United States," while the United States Rubber Company is the country's largest manufacturer of tyres and tubes.

While officials of the General Motors Corporation have not yet commented on the action, denials of the charges have been issued both by Mr. Crawford H. Greenewalt, president of du Pont, and by Herbert E. Smith, chairman of United States Rubber.

Mr. Greenewalt said: "The du Pont Company emphatically denies that its relationships with General Motors and the other companies mentioned in the complaint have been either illegal or in any way detrimental to the interest of the people of the United States. On the contrary, these relationships have served the public interest in a conspicuous way; and in that firm belief we will defend our actions and our present position with the utmost vigour."

Leader in Competitive Industry

Mr. Smith said: "The United States Rubber Company is a leader in one of the most highly competitive industries in America. We are in business to serve the public by providing the best possible products at the lowest possible prices."

In 1947 the combined assets of the three defendant corporations, according to Government figures, were $4259 million, their combined sales totalled $5189 million and their net income after taxes $429 million.

Chemical Statistics for April

Production Levels Maintained

BASIC chemicals in April showed little change either in consumption or production compared with the previous month. Production and stocks generally showed a slight reduction compared with April, 1948, except in the case of pig iron and steel ingots and castings.

There was a slight decrease in the total estimated numbers employed in April in the chemical and allied trades, compared with the March figures. Distribution (in thousands) was as follows: coke ovens, chemicals and dyes, and explosives 250.9 (184.1 men, 66.8 women); paints and varnishes 37.3 (26.2 men, 11.1 women); oils, greases, glue, etc., 64.0 (51.0 men, 13.0 women); pharmaceutical, toilet preparations, etc., 79.4 (40.6 men, 38.8 women). Total 431.6 compared with 432.0 in March.

These figures and the representative tables given below are extracted from the latest issue of the *Monthly Digest of Statistics*, No. 42, June (HMSO, 2s. 6d.).

	April, 1949 Thousand Tons			April, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	139.2	135.0	—	129.0	140.0	—
Sulphur	—	24.7	72.3	—	21.4	88.6
Pyrites	—	20.6	76.0	—	20.6	81.0
Spent oxide	—	15.9	168.0	—	16.4	167.0
Molasses (cane and beet)	10.3	26.8†	284.2	12.2	27.9†	187.9
Industrial alcohol (mil. bulk gal.)	1.86	2.39	5.07	1.81	2.84	5.96
Superphosphate	18.1	22.3	—	22.5	28.5	—
Compound fertislisers	142.2	210.4	—	184.7	230.8	—
Liming materials	—	430.9	—	—	413.3	—
Ammonia	—	6.94*	—	—	6.06*	—
Phosphate rock	—	82.1	174.7	—	91.8	201.0
Virgin aluminium	2.66	15.8	—	2.62	14.3	—
Virgin copper	—	23.6	115.4	—	33.3	84.3
Virgin zinc	—	13.6	50.6	—	19.1	38.8
Refined lead	—	13.7	33.9	—	17.7	34.1
Tin	—	1.62	20.5	—	2.30	12.6
Zinc concentrates	—	14.4	28.0	—	14.9	68.0
Pig iron	187.0*	—	260.0*	184.0*	—	184.0*
Steel ingots and castings (including alloys)	316.0*	—	1,097.0	293.0*	—	793.0
Rubber: Reclaimed	0.32‡	0.40‡	3.62‡	0.48‡	0.49‡	3.67‡
Natural (including latex	—	3.28‡	47.0‡	—	4.08‡	140.3‡
Synthetic	—	0.04‡	1.82‡	—	0.05‡	2.05‡

* May. † Distilling only. ‡ Average of five weeks.

SPREADING INDUSTRIAL ELECTRICITY'S WINTER LOAD

AS a result of experience gained last year the Electricity Sub Committee of the National Joint Advisory Council recommended that the same general administrative arrangements should be made for the coming winter.

With the fuller knowledge gained of the incidence of the peak load, it has been found possible to allow some easement in the contribution asked of industry.

During December, January and February as compared with the maximum load during the corresponding period of 1946-47 industry will be asked to cut its maximum peak demand on Mondays to Fridays inclusive by 20 per cent during the hours of 8 a.m. to 10 a.m., but during the hours of 10 a.m. to 12 noon the reduction asked for will only be 10 per cent.

From December 1, until January 15, a reduction of 20 per cent will also be necessary between the hours of 4 p.m. to 5.30 p.m. on Mondays to Fridays inclusive, but after that date the problem of the afternoon peak is to be left to the discretion of the regional boards.

The Government is asking the regional boards for industry to make the necessary arrangements to give effect to the cuts and will give them full support.

While the Government are confident that both sides of industry will once again show the same spirit of co-operation which has characterised these arrangements in the previous two winters, they have decided, in fairness to all public-spirited employers and workers, that statutory powers shall continue to be available to deal with unreasonable failure to operate approved load spreading arrangements.

GERMANY SEEKS NEW FOREIGN CONTACTS

New Vitamin B_2 Preparation in Production

IN view of the increased importance of export trade for West German industry, chemical manufacturers in the Anglo-U.S. zone have lately raised the demand that German experts, and in particular German trade associations, should be allowed to participate in commercial negotiations with foreign countries. They complain that trade agreements concluded by the occupying powers without " adequate " German participation have led to foreign competition in the German market which, " especially in the chemical industry, is already giving rise to serious apprehension."

The work for a European customs union, which has received considerable publicity in the German Press, is being watched with misgivings, because it is thought that it may result in " very grave complications " for the German chemical industry. Efforts are to be made to establish contact with foreign chemical organisations. As far as chemical plant expansion projects under the European Recovery Plan are concerned, German chemical circles hint that many of these are " contrary to natural conditions."

The extension of the trade agreement between the Anglo-U.S. zone of Germany and Sweden provides for shipments of German chemicals to Sweden to the value of nearly £1.6 million and a reciprocal acceptance of Swedish chemicals valued about £140,000 in the 12 months ending June, 1950.

Foreign Holdings

The plant of Kalle & Co., A.G., at Wiesbaden-Biebrich, will be the first of the former I. G. Farbenindustrie works to be offered for sale. Details of the procedure to be followed at this sale, which is described as a " test case," have not yet been completed, but it is understood that, as foreign interests held about 20 per cent of the I. G. Farbenindustrie capital, 20 per cent of the shares of a new company formed to take over the Kalle & Co. plant are to be reserved for possible later disposal to foreign interests.

The production of sulphuric acid is to be undertaken shortly in the western sectors of Berlin. In view of the inconvenience experienced during the blockade it is intended to establish suitable plant at the Berlin-Tegel gasworks; in addition to sulphuric acid, it will produce ammonium sulphate. About half the present acid requirements of Western Berlin are expected to be met by production at Tegel. The quantity involved is, however, small, as consumption has declined from about 3500 tons a month in normal times to between 300 and 400 tons.

A new process for the production of vitamin B_2 from whey has been developed by Herr Funck, a chemist of Beyer-Chemie GmbH at Saalfield. The new preparation is to be marketed under the trade name of "Viteusan-Funck-Beyer." Several thousand ampoules can be produced daily, and it is reported that the production process requires only two days.

The production of silicones is to begin shortly at the plant of Chemische Fabrik von Heyden at Dresden-Radebeul. The process to be used is said to have been developed during the war, based on research work carried out as early as 1934. The production of sulphonamides is to be undertaken in a new plant, and several new synthetic drugs are to be made, some of them on a salicylic acid basis.

German Technical Reports

THE Board of Trade announces that the following reports on German industries are now available from H.M. Stationery Office:

BIOS 1632. I. G. Ludwigshafen and Hochst. Notes on the manufacture of sulphuric acid and of vanadium catalyst. (2s.)

BIOS 1839. Welding of plastics in Germany. (22s. 6d.)

BIOS 1861. Light alloy foundries in Germany. (20s.)

BIOS 1869. Manufacture of synthetic phenol by the chlorination route at I. G. Farben Industries. A. G. Leverkusen. (5s. 6d.)

Additional summaries, considered unsuitable for publication, may be inspected at the TIDU, 40 Cadogan Square, S.W.1. They are:—

FD 3007/48. Interrogation of Dr. Demant of Peenemunde West—Notes on liquid propellants.

FD 3046/48. German pyrotechnic dyestuffs and synthetic consolidating materials to obviate the pressing of pyrotechnic compositions.

FD 1072/1948. The anthraquinone autoxodiation process for the production of hydrogen peroxide; a description of the above process and some details of a new still and column for purification and concentration.

NEW RUBBER USES

Competitive Products for Ceylon?

NOVEL methods of employing rubber to produce wood preservatives, insecticides, varnishes, paint thinners, and even paints (if colour powders are provided) are the subject of claims being made in Ceylon.

State assistance is being sought for the commercial adaptation of the processes involved, and it is claimed the paint-thinning preparations, wood-preservatives, and insecticides produced from rubber are as effective as turpentine, linseed oil, etc., and could be marketed for about half the price.

Before representations for State aid were made to Mr. G. G. Ponnambalam, Minister of Industries and Industrial Research, the new products are stated to have undergone extensive tests over a period of some months.

If the Government assistance is granted, it is anticipated that the rubber-based products could serve as a substitute for Ceylon's present requirements of turpentine, linseed oil, etc., and would be competitive in world markets.

Shark liver oil supply centres in Ceylon are experiencing a boom as a result of the increased consumption of the commodity in the island. There are about ten centres supplying the Department of Industries and Industrial Research with the raw material for the production of shark liver oil.

A number of dealers in Colombo, who formerly obtained their entire requirements from abroad, now make their purchases exclusively from the department's factory, as the quality of the local product is found to be superior to imported oil.

The import of cod liver oil, which at one time was a serious competitor, has dwindled considerably. Another rival, halibut oil, no longer seems to offer any serious competition.

Steel Production Record

TOTAL production of steel during the first six months of 1949 reached 7,949,000 tons, the highest half-yearly output ever achieved. That was 384,000 more than the previous record, in the first half of 1948.

The British Iron and Steel Federation reports that June production was at an annual rate of 15,645,000 tons. This was the highest rate ever achieved in the month, despite interruption by Whitsuntide holidays this year.

FATAL ACCIDENTS INCREASE

Few in Chemical Plants

MORE fatal industrial accidents and deaths from industrial diseases occurred in May than in April, according to figures reported in the last *Ministry of Labour Gazette*.

Deaths from accidents in the course of employment in the United Kingdom in May were 168 compared with 120 (revised figures) in April and 126 in May, 1948. Only three occurred in chemicals, oils, soaps, etc., while metal conversion accounted for five and other metal trades four.

Cases reported under the Factories Act, 1937, or the Lead Paint (Protection against Poisoning) Act, 1926, in the U.K. in May, disclosed one death in the oil industry due to epitheliamatous ulceration (skin cancer). Total cases reported under the two acts numbered 41, as follows:—Lead poisoning, four; compressed air illness, four; anthrax, three; epitheliomatous ulceration (skin cancer) 17 (pitch, nine; tar, six; oil, two); chrome ulceration 13 (manufacture of bichromates four: chromium plating, six; other industries, three).

BRIDGING THE DOLLAR GAP

IF we wanted to encourage the American investor, we must offer him reasonable security and a fair return, said Sir Norman Kipping, director-general of the Federation of British Industries, in a recent broadcast discussion with Mr. Robert Boothby, M.P. A programme of nationalisation was hardly calculated to inspire confidence in the security of industrial investments, he said.

With a few shining exceptions, British industry had barely started to drive into the dollar markets. There had so far been no incentive to British firms to concentrate on these markets, the most difficult in the world.

The problem had no easy answer and it could not be solved by any financial conjuring trick. It was a tough job for British industry, but it was not the first that we had tackled. Our national life now depended on the individual British manufacturer and merchant, and he was not beaten yet!

All-Party Government

"The Business Case for an All-Party Government" will be discussed at a British Sales Promotion Association luncheon meeting, at the Holborn Restaurant, London, W.C.1, on July 27.

S. AFRICA'S SODA ASH

Home Yield of 300 Tons Daily?

PLANS for South Africa's first soda ash factory are well under way, and it is hoped that work on the £5.5 million project to be established near Douglas in the Northern Cape will begin within the next few months. The realisation of the seven-year-old project is expected to confer important benefits on local industries. There is thought to be a possibility that, when production begins, probably in 1953, imports of soda ash may stop.

Processed steam to afford power for the factory will need up to 3000 kW. The factory will need 10 million gallons of water and about 1000 tons of coal a day and the soda ash output aimed at is 300 tons a day.

British and U.S. Supplies

Before the war, soda ash was imported from Germany and Japan. Lately the Union has been getting supplies from London and America. The soda ash factory will be the Union's biggest concern, apart from the steelworks in Pretoria. The work had been hampered by insufficient supplies of brine. Now a Johannesburg mining enterprise has bought for £70,000 1200 morgen of a farm on the banks of the Vaal River near the Broadway railway siding, where the factory will be established. The mining company has been spending £12,000 a year looking for an adequate brine supply; now the pumping site has been practically decided. The brine will be pumped through 22 miles of pipeline, laid at a cost of £100,000.

Rich Source of Salt

The brine source is a 200-morgen salt lake which produces 50,000 tons of salt a year—a third of the Union's salt output.

The district has a number of salt-pans which could be used for the supply of brine—but the finest salt-pan is hundreds of miles away between the red sand dunes nearly 200 miles from Upington. It contains an unparalleled supply of pure white crystallised salt in its circumference of 20 miles. It is believed that the mining firm has an option on the lake, but its remoteness and appalling roads militate against its exploitation. Could it be developed its yield might provide some 200,000 tons of salt a year. The Union's total salt production is about 120,000 tons a year, and about 80 per cent of this comes from pans within 100 miles of Kimberley.

PARLIAMENTARY TOPICS

Toxicity of Insecticides

REPLYING to a question by Mr. T. Driberg in the House of Commons last week, Mr. H. Morrison, Lord President of the Council, said the Agricultural Research Council and the Medical Research Council were aware of the potential dangers of the indiscriminate use of some of the new commercial insecticides and fungicides containing dangerous poisons, and there was a special toxicity sub-committee of the research co-ordinating committee on insecticides, a body appointed jointly by the Medical Research Council, the Department of Scientific and Industrial Research and the Agricultural Research Council, which arranged for the examination of new materials. As to the effect of insecticides and fungicides on plants, active and continuing research was in progress at several agricultural research institutes. In regard to the effect on human beings, the Agricultural Research Council worked in close collaboration with the toxicology committee of the Medical Research Council. The inquiries of that committee included long term studies.

* * *

A QUESTION by Mr. D. Lipson, to the Minister of Fuel and Power, drew from Mr. A. Robens the reply that at current prices the annual value of the British companies' share of the petrol production of Haifa refinery when working to full capacity would be about $16 million. It would, however, take some months to restore the refinery to a full rate of production. The potential dollar saving to us would be somewhat less than this amount.

* * *

REPLYING to Sir W. Smithers, Mr. John Strachey, Minister of Food, said that during his recent visit to East Africa he found that about one-half of the groundnut crop and about one-sixth of the sunflower crop had been harvested. Yields at Kongwa would be very low this year owing to the drought which had affected the whole of East Africa so severely. From the crop so far harvested the yields averaged 245 lb. for groundnuts and 99 lb. for sunflower per acre. Nevertheless, the first small shipments of oilseed to the United Kingdom would be made shortly.

* * *

THE Ministry of Supply's stocks of virgin copper, including stocks abroad, and afloat, were stated by Mr. G. R. Strauss to amount to approximately 170,000 tons on June 30.

Spray Cooling Ponds

Basic Considerations for Effective Operation

by H. L. M. LARCOMBE

VERY often the process or power engineer in a chemical plant is confronted with the job of designing and building a spray cooling pond. He may be totally unacquainted with the design of such equipment and consults a text-book. Here he usually finds himself confronted with one of two things: a general description of a spray pond which contains no actual design data, or, alternatively, a long involved thesis with equally involved nomenclature on the theory of heat transfer from liquid water particles. There are few sources of information on spray ponds which give sufficient data for a practical unit to be built, without resorting to given data which will enable the non-specialist to design and erect a spray-pond which will give dependable operation.

Atmospheric Conditions

The cooling of water by spraying into the atmosphere is effected by evaporation, conduction and radiation. In the hotter months of the year most of the cooling is done by evaporation; in the colder months by conduction and radiation.

The temperature of water entering a spray system is reduced a fixed amount depending on two atmospheric conditions—namely, the air dry bulb temperature, and the air wet bulb temperatures. This information should apply to the district and, if not readily available at the plant, it can usually be obtained from the local airport, newspaper, university or from the Meteorological Office publications. The cooling being less in the summer when the dry bulb temperatures are high, the average wet and dry bulb temperatures from May to September should be taken as the design basis.

In selecting the site for a pond, the engineer should choose a spot where obstructions such as buildings, and high stock piles, do not restrict proper air circulation around the sprays. Too exposed a site, however, is also to be avoided as this would make windage losses high and possibly create a communal nuisance if too near a public thoroughfare. If space is limited and the spray nozzle clusters are arranged less than 12 ft. from the edge of the pond, a louvre fence should be installed. This should have a high percentage free area and be arranged so that the drips drain back into the pond. If the distance between the nozzle cluster and the edge of the pond is 25 ft. or more, the louvre fence may be dispensed with. A roof can be a good ground-conserving site for a spray pond, but in every case it is necessary to install a louvre fence to prevent wind loss.

Cooling Capacity

Fig. 1 shows the cooling which could safely be expected from a cooling plant when designed in the manner outlined in this paper. It assumes a 5-m.p.h. wind blowing. This chart is based on actual tests carried out over a period of twenty years by Spray Engineering Company in the U.S.A., and constant re-checking has

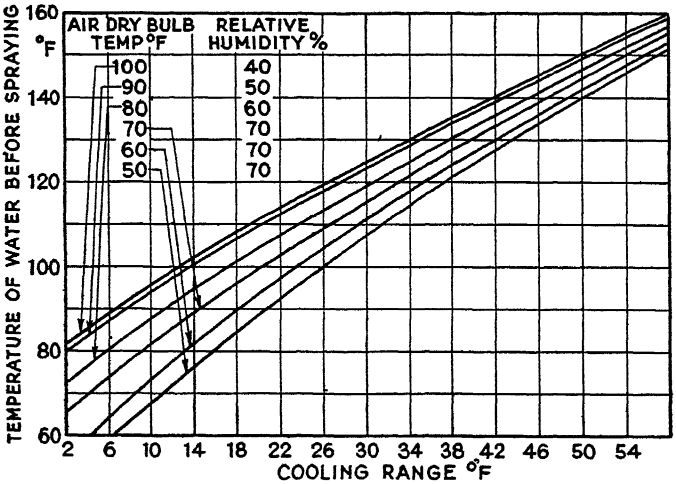


Fig. 1

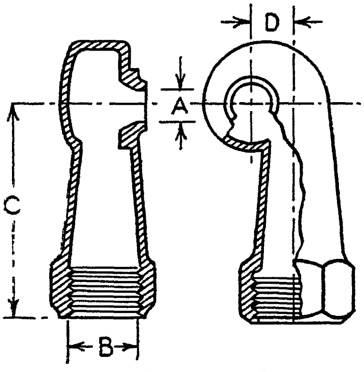
proved it to be accurate. The make-up water average does not exceed 2 per cent of the quantity of water sprayed. When the local atmospheric conditions are obtained, the relative humidity should be ascertained from psychrometric chart and used with the temperature of the water before spraying to find the cooling range through which the water will be cooled.

Nozzle Type

The type of nozzle[1] is probably the most important part of any spray pond. It should effect a fine uniform break-up of the water without having to exert an uneconomical high pressure. The droplets should not be so fine as to cause excessive wind loss and the spray height should be such as to get maximum cooling without having to resort to an excessively high louvre fence.

The nozzle should not have a small orifice or small internal passages which could be clogged by pipe scale or foreign matter. It should have a large internal free passage way, first to pass solids, and second, to reduce the pressure required to operate it, consequently reducing the head on the feed pump and thereby saving power. A pressure too low, however, will not effect a good break-up and will merely eject an unbroken stream of water. The spray contour should be such that a wide hollow cone is initially formed which gives a maximum area in contact with the atmosphere.

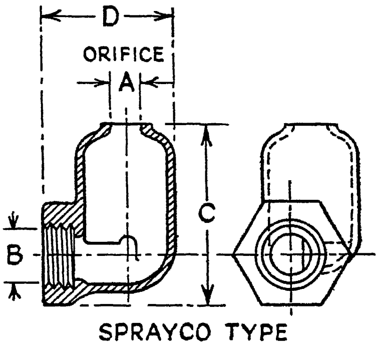
The form of nozzle which fulfils these requirements adequately is that shown in Fig. 2. It has been used successfully in practice over a long period and its full performance in all its sizes has been described more fully on a previous occasion. The best material for these nozzles for most general purposes is bronze, although certain contaminated waters may point to the use of more suitable corrosion-resistant material.



YARWAY TYPE

A	B	C	D
7/8"	1½"	7"	7/8"
1 9/64"	2"	9½"	1 9/64
1 3/8"	2½"	12"	1 3/8"

Fig. 2



SPRAYCO TYPE

A	B	C	D
7/8"	1½"	4¼"	3¾"
1 9/64"	2"	5"	4⅛"
1 3/8"	2½"	7¼"	5

Fig. 3

The practice of dispensing with nozzles and merely using lengths of perforated pipe is not recommended as it does not give a good spray form at low pressures and can also prove much dearer in initial cost.

The nozzle which is a good practical size has an orifice of not less than 1 in. with an operating pressure of 7 p.s.i. Good pattern nozzles are the Yarway Involute type and the American Sprayco type shown in Fig. 3. The recommended orifice sizes for these two types are 1 1/32 in. and 1 9/64 in. respectively, with an operating pressure of 7 p.s.i. These will give good service, although for the sake of the extra information, other orifice sizes are shown in Fig. 4.

The Flat-Spray nozzle has been suggested for spray pond work and although useful in places where space is limited, the nozzles are not usually made in the relatively large orifice sizes which are necessary to avoid clogging.

The details of construction of a pond will repay all the thought put into their design. Take the case of the piping and spray system first. Spray nozzles could be mounted in clusters of four in cruciform

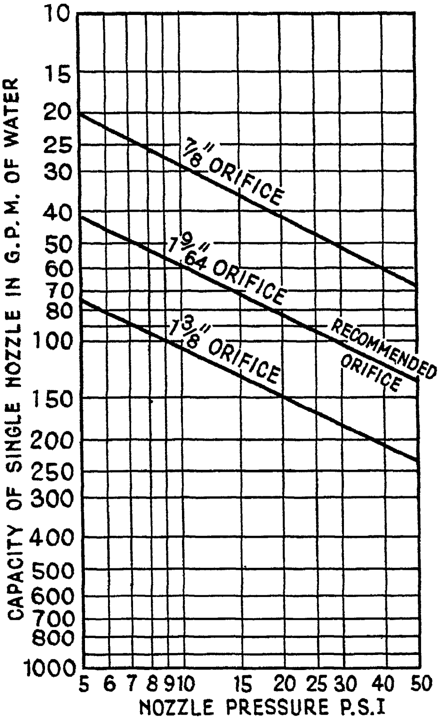


Fig. 4: Nozzle capacity

shape and be fed from a central supply line. A spacing which has been found satisfactory in numerous installations, using the type of nozzle shown in Figs. 2 and 3, is 13-ft. centres between the nozzle clusters along the supply pipes and 25-ft. between the rows of nozzle clusters and, as mentioned previously, 25-ft. from the edge of the pond where no louvre fence is contemplated, and 12-ft. where a fence is found desirable or necessary.

The main supply line and branch supply lines should be installed on piers or supports resting on the bed of the pond. They should be anchored in such a manner as to allow for pipe expansion due to the hot water inside and a roller or knife edge skid used to take care of movement. The spray arms should be of galvanised steel to allow screwing and, although the material can be used for the main and branch supply pipes, it is considered better practice to use cast iron pipe and fitting for these. Pressure drop along the supply pipes can be calculated by the normal formulæ, the recommended pressure shown in Fig. 4 should be maintained at the nozzle.

The nozzle should spray vertically upwards and be located approximately 5-ft. above the surface of the water level in the pond. To allow drainage from the piping system, it is usual to fit a drip spray which is normally about $\frac{1}{4}$ in.-$\frac{3}{8}$ in. bore.

Where the pond basin is of concrete, it is advisable to have mastic expansion joints if the temperature of the water makes this necessary. Spacing for these expansion joints is normally about 25-ft. A suction well should be fitted with a screen to exclude foreign matter. If oil is present in the water being sprayed the suction well can be made in the form of an underflow trap so as to exclude oil at the pump suction.

The level of the water below the top of the tank should be at least 1 ft., exclusive of the louvre fence and the depth of 2 to 3 ft.

Where a steel or cast iron tank is used, it is also necessary to consider expansion; this can be achieved by the usual methods associated with their construction.

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Rain Repellent

A WAX-LIKE rain-repellent substance expected to assist aerial navigation has been patented by a scientist of the National Research Council of Canada. The rain-repellent, perfected after seven years' research by Dr. D. F. Stedman, of the Council's chemistry division, has proved successful under aircraft tests both in Canada and the U.S.A. The substance, when applied to the aircraft's windscreen, breaks down rain drops into droplets which are driven off into the air-stream. The action is so quick that to the pilot the windscreen appears dry. The materials used are non-corrosive and do not damage paint finishes. Other tests have been carried out by an RAF establishment in England and by the engineering staff of the Trans-Canada Air Lines. The new formulation, which the Toronto (Fibre Glass) Company will produce commercially is not likely to be suitable for motor windscreens. The condition of wind pressure at high velocity is required for its completely successful use.

THE NEW PEROXIDE CATALYSTS

Means to Better Resin Polymerisation

From A SPECIAL CORRESPONDENT

THE development of new types of resins calls for new catalysts. Available to-day are some 15 different organic peroxides for the bulk polymerisation of vinyl and acrylic resins as well as the polyesters used for laminating and for moulding and casting.

Choice of a suitable catalyst is of the greatest importance to the resin manufacturer as it enables him to regulate production, using an established curing cycle at specified time and temperature. There is no such thing as a universal catalyst and each resin system usually calls for a special type of catalyst.

Manufacturers hitherto have been satisfied with one or two catalysts, benzoyl peroxide being the best known. It is now realised that this peroxide, although the most satisfactory general purpose catalyst available, has its limitations and it is not suitable for some of the new polyesters which are required to cure at room temperatures; moreover, it is not able to give the best results with polyesters to be used for casting or moulding.

Serious defects in manufactured resins such as poor colour, variable physical properties and indifferent storage characteristics can often be traced either to the use of the wrong catalyst or the maintenance of unsatisfactory conditions of polymerisation.

Six Groups

The peroxide catalysts now being employed in the plastics industry fall into six distinct groups. The most important of these is the diacyl peroxides of which benzoyl peroxide, lauroyl peroxide, 2,4-dichlorobenzoyl peroxide and *p*-chlorobenzoyl peroxide are the best known.

The aldehyde peroxides include hydroxyheptyl peroxide and dibenzaldiperoxide; the ketone peroxides consist of methyl ethyl ketone peroxide, 1-hydroxycyclohexyl hydroperoxide-1, methyl isobutyl ketone peroxide and methyl amyl ketone peroxide.

Additionally, there are alkyl hydroperoxides, such as t-butyl hydroperoxide; alkyl peresters like di-t-butyl diper phthalate, t-butyl perbenzoate and alkyl acid peresters such as t-butyl permaleic acid and t-butyl perphthalic acid. These vary in active oxygen contents from about 2.10 per cent for 2, 4-dichlorobenzoyl to 15.50 per cent for methyl amyl ketone peroxide. Physical forms also vary; some peroxides are fine white powders, others pastes and liquids.

It has recently become the practice to use some of the peroxides compounded with plasticisers so as to improve their shelf life without loss of activity. Benzoyl peroxide is now extended with dibutyl phthalate; *p*-chlorobenzoyl peroxide compounded with tricresyl phosphate and methyl ethyl ketone peroxide dissolved in dimethyl phthalate. The extended peroxides are either pastes or viscous liquids which possess improved solubility in monomers to be polymerised.

Special Qualities

Evaluation of peroxides as catalysts is very difficult because the requirements of the resin manufacturer and resin user vary so much. It is, however, possible to summarise some of the more important of the desirable characteristics which the manufacturer looks for in new peroxide catalysts:—

1. The catalyst must be available at low cost and effective as a gelling agent at low concentrations. This is essential as competition in the plastics industry is becoming so keen that expensive catalysts may make a resin too costly to use on a large scale.
2. The peroxide should dissolve in the monomer to give a colourless solution; moreover, the presence of the catalyst in the resin should not bring about any deterioration in colour value after polymerisation.
3. The peroxide must possess a reasonably good shelf life and be suitable in one form or another; *e.g.*, in its extended form, for shipping abroad. In the past one of the main criticisms of peroxide catalysts was that they were hazardous chemicals with doubtful and unreliable storage characteristics.

There is no doubt that the extended forms of catalysts have a greatly improved shelf life. The resin/catalyst system must additionally possess a sufficiently good tank life to allow for processing over any reasonable period; *e.g.*, polyester resins for continuous laminating require a long tank life, whereas polyesters for casting need a comparatively short tank life. The catalyst should lend itself to adjustment of gelation properties by varying the percentage present in the resin, but such adjustment should not be too fine.

4. The catalyst should be active at relatively low temperature, *e.g.*, 75-90°F. This is very important for contact pressure laminating, but it is not so vital for moulding compositions which are subjected to relatively high temperatures but have a slow cure period.

5. The exothermic reaction arising from the use of a catalyst in polymerisation should not be too violent, otherwise the colour of the resin is liable to be seriously impaired and other properties are also inclined to suffer. The tendency nowadays is to use catalyst mixtures composed of two organic peroxides which are able to reduce the amount of heat generated without any compensating retarding of the speed of gelation. This is particularly important in certain types of low-pressure laminating work.

6. The catalyst should not promote crazing of the resin, even when relatively high catalyst concentrations are employed. It is a practice of a number of manufacturers to increase the percentage of catalyst so as to compensate for the absence of externally applied heat. It has to be borne in mind, however, that the presence of chemical promoters, inhibitors and other additives can influence crazing and other characteristics of the polymerised resin.

Catalysts used in the plastics industry are usually grouped under such headings as low-temperature, intermediate-temperature and high-temperature, indicating the conditions under which the resins have to be cured. Benzoyl peroxide, with an active oxygen content of 6.3 per cent, comes in the intermediate group, which includes those catalysts which are typified by their wide variation in the gelling times of polyester resin and cure rates at curing temperatures above 150°F.

Other peroxides in the intermediate group include methyl amyl ketone peroxide, with an oxygen content of 15.50 per cent; lauroyl peroxide, having an oxygen content of 3.76 per cent; t-butyl permaleic acid, 6.4 per cent oxygen; t-butyl perbenzoates, 7.8 per cent oxygen; di-t-butyl diperphthalate, 9.80 per cent active oxygen; t-butyl perphthalic acid, 6.40 per cent oxygen; and *p*-chlorobenzoyl peroxide, containing 4.90 per cent oxygen.

The low-temperature group includes hydroxyheptyl peroxide, with an active oxygen content of 5.80 per cent; methyl ethyl ketone peroxide in dimethyl phthalate, 11.06 per cent oxygen; methyl isobutyl ketone peroxide in dimethyl phthalate, possessing the same oxygen content; 1-hydroxycyclo-hexyl hydroperoxide-1, 11 per cent oxygen: dibenzaldiperoxide compounded with tricresyl phosphate, 6.60 per cent oxygen; and t-butyl hydroperoxide 10.60 per cent active oxygen.

Catalysts in the low-temperature groups are particularly suitable for contact pressure moulding to be carried out at 75-90°F. and casting at room temperatures. In the high-temperature group the only important peroxide is dibenzaldiperoxide, which has an active oxygen content of 6.60 per cent.

CLEANER COAL PROSPECTS—TWO YEARS HENCE?

WHAT is stated to be the largest coal cleaning plant in the country is to be installed at Lynemouth colliery, Northumberland. This part of the programme which the National Coal Board has set in motion to improve the quality of coal, is also a section of a £2½ million reconstruction scheme embracing Lynemouth and Newbiggin collieries in the northern division.

This scheme, by which production will be concentrated at Lynemouth colliery, is expected to help raise the output of coal from these collieries from 600,000 tons to 1½ million tons a year. Work on the new washery, which will cost £731,000, will be completed in about two years' time. It will clean 800 tons an hour.

Three cleaning processes will be used in the new project. All coal between 8 in. and 1½ in. will be washed in a Ridley-Scholes washer, which was designed by two British engineers five years ago. In this method the coal is passed through a bath containing a mixture of finely ground magnetite in water. The dirt sinks, and the clean coal which floats is carried away by a stream of liquid and then drained and sprayed.

Smaller coal from 1½ in. to 1/50 in. will be treated in a separate plant designed by the Automatic Coal Cleaning Co., Ltd., of Carlisle, while the finest particles below 1/50 in. will be cleaned in a froth flotation plant designed by Unifloc Reagents, Ltd., of Swansea.

The whole installation embodying the three systems will be constructed by the Mitchell Engineering Group, of London.

MINIMISING RADIOACTIVE HAZARDS

Apparatus to Avoid Contamination

From OUR NEW YORK CORRESPONDENT

RADIOACTIVE isotopes are being increasingly used in medical, biochemical and industrial research, which involves considerable hazards for the chemist who must handle small but potent quantities of radioactive material. To avoid contamination of the laboratory and to control these materials through normal chemical processes without losses, better apparatus is required.

A step towards minimising such dangers is a versatile and compact piece of apparatus developed by Dr. Clyde A. Dubbs, of the medical research laboratory, Veterans Administration Centre, Los Angeles, California.

The equipment consists of a simple V-shaped glass assembly which makes it possible to carry out a long series of intricate operations without transferring the material from one container to another. There is no possibility of contamination by liquids which might normally trickle down the outside surfaces of vessels during pouring, nor by particles escaping to the air or adhering to glass and filter paper.

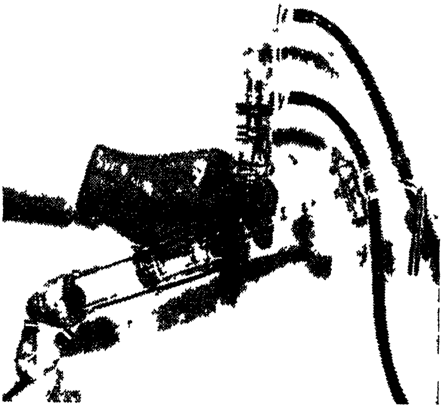
The device consists of two tubes, each having a capacity of 50 cu. cm. (a little less than 4 oz.), joined at an angle by a piece containing a stopcock.

Reducing Atmospheric Pressure

By inserting a filter disc in one of the tubes and piercing the filter with a thin hollow tube, a chemist can filter, distill, condense, centrifuge, and dry a material without taking the equipment apart. In the case of delicate biological materials which cannot be boiled at normal atmospheric pressure, the pressure can be reduced by pumping out air through the stopcock.

Dr. Dubbs has explained how a water solution of starch is prepared in his new apparatus, pointing out that material would have to be poured from one container to another five times if conventional equipment were employed.

One tube contains a leaf homogenate which has been prepared directly therein by grinding a leaf with concentrated alcohol, using a rotating pestle. Within the ground glass joint of this tube is a sieve covered with filter paper except where a small tube passes through the centre. After air has been removed, the apparatus is turned so that the alcohol filters into the second tube. Some of the homogenate is deposited on the filter paper, while much of it is left clinging to the walls of the first tube.



Versatile and compact apparatus for lessening laboratory radioactive contamination

To wash down this residue, which is chiefly starch, the liquid in the lower tube is boiled with the aid of a heating jacket. The alcohol vapours rise into the upper tube, condense there, and trickle down the sides.

About 15 minutes later, the lower tube containing the alcohol is removed, emptied, and refilled with an acid-alcohol mixture, required to make the starch soluble in water. The apparatus is then inverted so that the acid-alcohol washes the starchy residue from the filter.

The lower tube is then heated and the liquid boiled for another 15 minutes until the starch is dissolved. Finally, the starch solution is filtered, and the entire procedure is repeated to substitute water for the acid-alcohol.

The apparatus, by providing a means of processing radioactive material (for example, the isolation of Carvon-14 glucose from a photosynthesising leaf) through a series of treatments in a *closed* system minimises contamination of the atmosphere with radioactivity. It thereby diminishes the health hazard and aids in maintaining a satisfactory low background count in the laboratory. The closed system feature is especially advantageous when high temperature treatments such as extraction, reflux and distillation are involved.

PROPERTIES OF LIQUID HELIUM

"A Perfect Thermal Conductor"

THE behaviour of liquid helium, which defies gravity when brought to very low temperature, has proved an unexpected asset to scientists, Dr. H. A. Fairbank, of Yale University, told a symposium of the American Chemical Society's Division of Physical and Inorganic Chemistry at its recent meeting in Pittsburgh, Pa.

Of the two isotopes of the element helium, helium-3 and helium-4, the former is so rare that its atoms are outnumbered ten million to one in the helium obtained from natural gas wells. This has made the isotope extremely difficult to study.

Fortunately, however, helium-3 is more stable than its twin, which has enabled scientists to formulate a remarkably efficient means of separating the two, Dr. Fairbank stated.

As a lightweight, non-inflammable gas, helium is used in dirigibles and in many industrial operations requiring an inert atmosphere. A mixture of helium with oxygen also has proved valuable in protecting divers from caisson disease.

Very Low Temperature

The properties of helium have aroused new interest among scientists in recent years, Dr. Fairbank said, because of the discovery of the remarkable effect of cooling the liquid element to a temperature close to absolute zero.

"When helium is cooled," he pointed out, "it remains in the gaseous state until it is lowered to within 4.2° of absolute zero, when it liquefies. The liquid behaves in a reasonably normal fashion at this temperature, but when cooled below 2.19° (above absolute zero), it is transformed into a 'superfluid' with unique and exciting properties.

"The liquid appears to be almost a perfect conductor of heat, having a heat conductivity higher than any substance known. It has very unusual flow properties and will leak through the tiniest crack. When contained in a vessel, a film will form on the walls and the liquid will creep out over the side of the vessel as long as the level outside is lower than the level inside.

"These various properties are described in current theories by assuming that liquid helium (below 2.19°) consists of two non-interacting components, one component a normal fluid with normal fluid properties and the other a superfluid which flows without friction and in general behaves like a perfect fluid. It is possible, by applying heat to one portion of the liquid, to have a flow of superfluid helium in one direction and normal helium in the other simultaneously, with no net flow of the liquid as a whole."

Behaviour of Helium Mixtures

Investigators have been anxious to learn how a liquid containing a mixture of helium-3 and helium-4 behaves, and also what properties pure helium-3 possesses, he continued. In answering the first question, he said, a powerful method has been provided for separating the scarce helium-3 from helium-4, a development which promises to provide "fair quantities" of pure helium 3.

The helium-3 isotope participates only in the flow of the normal component and not the superfluid component of liquid helium. It has been found, for example, that helium-3 will not flow through small slits or in the film creeping up the side of a vessel containing liquid helium. In both these instances it is the superfluid which flows, and it follows, therefore, that helium-3 is not participating in the superfluid flow.

"At Yale, we have confirmed the same effect in a slightly different way by producing a flow of heat through a container of liquid helium-3 and helium-4," Dr. Fairbank continued. "In this case we find that the helium-3 flows in the direction of the heat (with the normal component of liquid helium-4) and collects in one portion of the vessel.

"Aside from the scientific interest in these facts, they provide unusually efficient means of separating the two isotopes. In particular, we have succeeded in using the latter method of enriching a sample of helium by a factor of several hundred in the helium-3 isotope."

Oil Reserves in Pakistan

Hopes that the search for oil, which has been proceeding in Pakistan since the war, may soon be rewarded by success are expressed by experts. Wells were bored at Khattan, south-east of Quetta, in 1885, but the venture was financially a failure. The main source of oil at present is the Potwar plateau, near Rawalpindi.

DEVELOPMENTS IN PLASTIC PACKAGING

Wide Adaptability of Alkathene Films

THE adaptability of some of the newer plastic materials for packaging products ranging from chemicals and engineering components to foodstuffs was called to mind in London last week by the plastics division of Imperial Chemical Industries, Ltd.

The subject was Alkathene film, the patent for which was filed in 1936. Its production was given high priority during the war for use in insulation of radar and submarine cables. It has been produced in the U.S.A. for some years under licence from I.C.I.

"Layflat" tube is a development of Alkathene film. It is produced as a thin-walled seamless tube in continuous lengths, easily cut into suitable sizes and sealed by heat.

At present layflat tube is being made in the following sizes: Film thicknesses of nominal 0.0025 in. Layflat widths of 3 in. to 5 in. in ½ in. steps (*i.e.*, tube diameters from 1.91 in. to 3.17 in.).

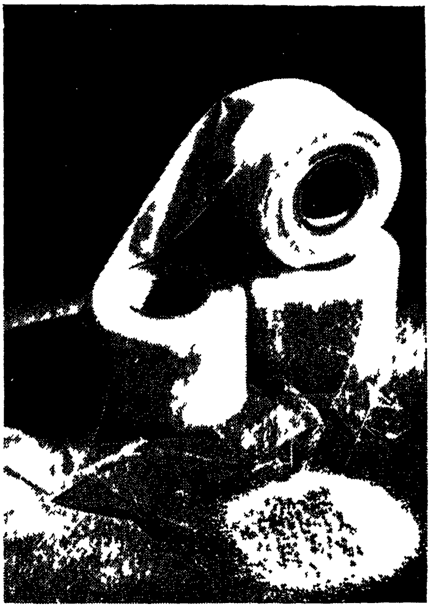
Between now and the end of 1949, enough layflat tube will be available for extensive packaging trials and market evaluation. The range is being increased to include layflat widths from 2 in. to 24 in. (*i.e.*, 1.27 in. to 15.7 in. tube diameters) and thicknesses from 0.0015 in. to 0.005 in. Large-scale production capacity will be ready by the beginning of 1950.

The introduction of layflat tube coincides with the coming into operation of the first large-scale plant in Great Britain for the production of Alkathene film, which is producing continuous rolls up to 46 in. wide.

Chemical Container

Both the layflat tube and the film are distinguished by good transparency and high resistance to water, water vapour and chemical action, according to notes produced by the makers. They remain flexible at temperatures as low as −60°C. Under ordinary service conditions, appearance, handle and physical properties are unaffected, though prolonged exposure to bright sunlight, especially in the tropics, may cause some embrittlement.

Although it is one of the lightest plastics known, Alkathene is said to have a toughness and flexibility to make it suitable for packaging a variety of chemicals. An interesting development of this is the use of large bags which can be used inside drums enabling the latter to be kept clean for further use. Other industrial applications already in use are for wrapping crêpe rubber for shipment from Malaya and packaging carbon black.



One of the more promising forms of the plastic is as a small container fabricated from the continuous tubular rolls shown here

The adaptability of the material to a wide variety of packing methods was shown by exhibits ranging from liquids, chemicals, and powders to foodstuffs, tools, engineering equipment and materials. Oil is one of the few unsuitable liquids, as it will gradually permeate the film.

A minor disadvantage at present is the cost, which is slightly higher than in America, where sources of cheap ethylene are an advantage. This may be rectified as soon as the new oil cracking plants are in production in the U.K.

Coloured Stainless Steel

Coloured stainless steel is reported to have been produced experimentally in Sheffield after much research.

Widening Range of South African Supplies

Committee Studies Chemical Import Control

A HEAD Advisory Committee has been established to assist the Directorate of Imports and Exports in relation to the importation of all commodities required by the chemical industry. A statement issued by the Director of Imports and Exports says that the industry, for the purpose of import control, has been divided into six groups. A group committee for pharmaceuticals has been set up, and committees for the remaining groups will be established shortly. The chairman or his deputy on all the group committees would become a member of the Head Advisory Committee for the chemical industry.

* * *

The Unico Chemical Co. (Pty.), Ltd., 47 La Rochelle Road, Johannesburg, has opened a new department for the preparation of chemicals for the tanning industry, the preservation of hides, etc.

* * *

Rapid progress is being made with the establishment of the first cement factory in Northern Rhodesia. This factory, ten miles south of Lusaka, is designed to produce up to 100,000 tons of cement a year. The limestone at the site is stated to be of high quality and has the quality of setting rapidly. The raw material is said to exist there in "unlimited quantities." Small quantities of gypsum will have to be imported. The cement works is being financed by the Colonial Development Corporation, with a contribution of £250,000 from the Northern Rhodesia Government, and is expected to cost £750,000.

* * *

Sulphonated oils, cutting oils and oils for the textile industry are now manufactured by a Port Elizabeth firm of polish and stain manufacturers. The services of highly qualified chemists have been secured and the firm claims to be in a position to supply these new lines in quantity and of a quality equal to anything produced elsewhere.

* * *

An importer of shea butter nut oil has applied to the Board of Trade and Industries for free admission of this product, which is subject to a duty of 20 per cent *ad valorem* under tariff item 202 (2). The Association of Chambers of Commerce of South Africa and the South African Soap Manufacturers' Association support the application on the grounds that the soap manufacturing industry is at present permitted to import its requirements of various types of oil under rebate of duty for soap manufacturing purposes only. In view of all this support and because the supply of oils for soap making is still irregular, the board has recommended to the Government that the whole duty on these oils be rebated.

* *

The South African Standards Bulletin reports that the first South African standardisation mark for car batteries was awarded to an East London manufacturer recently after the Bureau of Standards had completed exhaustive tests of the products. The Standards Council's specification for motor vehicle batteries, of which 1000 are made in the Union each day, sets a standard for South African batteries equal to that of imported batteries.

* * *

Lewis Berger & Sons (S.A.), Ltd., Gale Street, Durban, has recently acquired adjoining premises so that a new ball mill plant could be installed and other urgent additions made to the factory, which is producing a wide range of quality paints in regular use in the Union.

$10 MILLION ASBESTOS PLAN

A LARGE increase in the production of asbestos in Canada, already the source of some 70-80 per cent of total supplies in the West, is foreshadowed by the decision to spend $10 million in developing newly discovered deposits near Larder Lake, 300 miles North-West of Ontario.

This development is proposed by the Johns-Manville Corporation which, it is understood, had formerly earmarked the expenditure for the expansion of Johns-Manville's Asbestos, Quebec. A strike there, called by a mining union of the Canadian Catholic Confederation of Labour, which has lasted more than 19 weeks, has curtailed production and is said to be responsible for the change of plan.

The Larder Lake discovery, according to Mr. L. H. Brown, chairman of the Johns-Manville Corporation, contains " fibre of unusual qualities." To aid in its exploitation, the company plans to start moving some of its equipment from Asbestos into the Larder Lake area as soon as possible.

The new find and its exploitation are regarded as highly important, because the demands for asbestos have exceeded supply for five years.

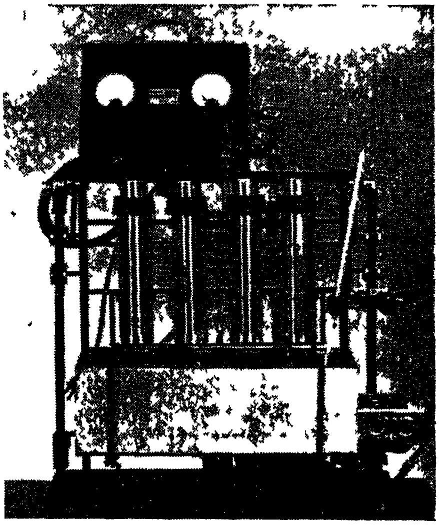
AMERICAN CHEMICAL NOTEBOOK * *

* * * * From OUR NEW YORK CORRESPONDENT

Molecular distillation for semi-micro analyses may be carried out on several samples simultaneously in a new still now being manufactured in the U.S.A. Operating under high vacuum to pressures as low as 1×10^{-5} mm. of mercury, the stills are used to separate heat-sensitive substances of high molecular weight. Samples are loaded into each still unit which are controlled through a resistor. The distillate collects on the condenser, which is removed to obtain the fraction after each distillation. Samples may range from a few milligrams to a gram in each still unit. This new analytical still was orginally designed for use in the biochemistry department of Distillation Products, Inc., Rochester, New York, to separate vitamin E from oils extracted from foods and other biological materials. Added uses in the organic chemistry departments warranted production of a number of these stills and they are now to be available to other laboratories.

* * *

An ingenious publicity and information device at the recent annual convention of the American Waterworks Association, held in Chicago, Illinois, was an " action demonstration " of the ability of a chemical to control corrosion in a water system. Visiting municipal engineers and officials saw iron test samples rusting in plain tap water in a jar, as a result of electrolytic action, while similar iron samples remained relatively clean and corrosion-free in a duplicate jar of tap water to which small amounts of the chemical material Calgon vitreous sodium phosphate had been added. Each iron strip was connected to a copper strip in the same jar, to provide electrolytic action due to the dissimilarity of the metals. The connecting wire looped out of the water and a timer permitted breaking of the circuit on a six-second cycle. A red light flashed over each jar as the circuit from that particular jar closed and the current generated by the galvanic cell was measured by a milliammeter. At the same time the circuit in the other jar was by-passed around the meters. The amount of current flowing between the dissimilar metals is a measure of the corrosion occurring and the effect of the Calgon was to reduce the current flow almost to zero.



New U.S. molecular distillation plant

Potassium dicyanoguanidine, first described in the literature in 1945, is a stable salt which can be readily converted to the free acid, or to other salts. Many of its reactions have still to be investigated, but its availability in experimental quantities has been recently announced by the new product development department of the American Cyanamid Co., New York. Dicyanoguanidine can be isolated as a crystalline solid, which is unstable upon storage. It is readily soluble in water, and its acid strength is comparable to that of hydrochloric acid.

* * *

Triethyl phosphate, only recently made available in commercial quantities, has already found wide use in the chemical industry in a variety of applications. It is very resistant to hydrolysis at ordinary temperatures, is said to possess exceptional purity, and is soluble in water and most organic solvents. One of the major uses of triethyl phosphate is as an intermediate in the preparation of the insecticide tetraethyl pyrophosphate. The specifications, properties and uses of the chemical, and a bibliography of technical literature, are contained in a bulletin now available from the Tennessee Eastman Corporation, Kingsport, Tenn

INDUSTRIAL VALUE OF NATURAL GAS

U.S. Source of Chemicals and Energy

ONCE an unwelcome waste-product of the oil fields, natural gas now provides one-seventh of all the energy produced in the U.S.A. It already has more than 20,000 uses in industry, states an article in a recent issue of *The Lamp*, published by the Standard Oil Company, New Jersey.

By 1925 natural gas was serving 3.5 million persons in 23 States, but still it could be used in volume only within a few hundred miles of the oil fields. Elsewhere it was unknown. Soon after, however, welded steel and seamless pipes were developed, through which gas could be pumped under high pressures, and consumption rose rapidly.

Cheapness

Natural gas is cheaper to use than either coal or oil, and it is by far the most convenient. In the U.S.A. it is estimated to cost rather more than one-third of the price of manufactured gas, although it yields twice as much heat.

Gas fresh from the well is called "wet" gas and contains hydrocarbon molecules of a wide range—from the very light to the heavier ones found in crude oil. The proportion varies but, as a fair example, the wet gas produced with oil in the Loudon pool of Illinois consists approximately of: methane 74.2 per cent, ethane 6.2 per cent, propane 9.5 per cent, butane 6.5 per cent, pentane 2.3 per cent, and hexane plus 1.3 per cent.

" Hexane plus " includes all the heavier fractions grouped for convenience.

All these fractions are fine fuels, but not all are gases. Methane, having the smallest molecules, is the lightest fraction; it remains a gas (at sea-level atmospheric pressure) even at minus 258°F., below which point it becomes liquid. But propane changes between its gas and liquid states at minus 14°, normal butane at plus 30°, normal hexane at plus 156°. Thus, at a given pressure, the fractions react differently to temperature changes.

Pressure and Temperature

Likewise, the fractions respond differently to different pressures. At a temperature of 60°, methane remains a gas under extreme pressure; propane, and especially butane, need little pressure to become liquid; and pentane and hexane are liquid at normal atmospheric pressure. Thus pressure and temperature are the basic tools of the engineer to separate the components of a wet gas.

Whether it comes from an oil reservoir or a purely gas reservoir, wet gas also may contain sulphur, water, nitrogen or carbon dioxide. These impurities, like the wet fractions of the gas, usually are removed before the product is delivered into pipelines.

Chemical treatment and processing under proper conditions of temperature and pressure remove the unwanted portions. In a typical field, the resulting dry gas includes 95.7 per cent of methane and ethane, which go into the pipeline as natural gas; and 4.3 per cent of propane and butane, which are liquefied for chemical and industrial markets.

Separating the fractions of a gas, and removing the impurities, are the functions of a recovery plant making us of the temperature-pressure differences. Natural gasoline is stripped out, to become a valuable addition to regular gasoline in the refinery. Propane and butane, as raw material for chemical plants and as bottled gas, find ready markets. Heavier fractions go to a refinery to be mixed with a regular run. What is left (methane and ethane) is a good dry gas.

Eliminating Flares

As fast as steel becomes available and the economics of the situation makes it feasible, the old time flares—symbols of an antiquated waste—are disappearing from the oil states. The industry looks forward to eliminating flares within a few years in all but the smallest fields.

Wherever cheap natural gas has become available new and often ingenious uses are being found for it, normally in association with its rôle as a fuel.

The main use of gas is in the firing of steam boilers in large electric-power plants; one such facility in Southern California can use more gas than the New England States together consume for all purposes.

The deeper drilling for oil that is now widespread is opening vast new reservoirs of gas, for deeper formations tend to have more gas than oil. Economists estimate that, by the end of 1955, the U.S.A. will have proved reserves of perhaps 200 trillion ft.—even if consumption continues to rise as in the past few years.

Technical Publications

THE American pail type of packing for exports of paints and a variety of other materials has gained wide acceptance in recent years and seems likely to increase its popularity as a result of a useful modification just introduced by Reads, Ltd., of Liverpool. The company has patented a method to permit the handles, which are prone to take up a disproportionate amount of shipping space, to be packed separately. The "ears," to which the handle was formerly permanently attached, are grooved so that the loose handle can be attached when necessary. When the handle is raised for carrying the grooves are deformed so that the handle cannot become detached.

* * *

GAS drying methods employing chemicals (such as phosphorus pentoxide, sulphuric acid, etc.), or refrigerators both have considerable disadvantages. In solid adsorption, moisture is trapped on the surface of a specially prepared porous, granular material. An advantage claimed for the Lectrodryers described in the latest catalogue of Birlec, Ltd., Birmingham, is that the activated alumina used as an adsorbent can be reactivated when heated without removal from the drying unit. Also of interest are the company's equipment for reducing humidity in the atmosphere, and air-conditioning in dry storage.

* * *

BRINGING to a total of 33 the number of safety manuals it has prepared for supervisory staffs and management in the chemical industry, the Manufacturing Chemists' Association, 246 Woodward Building, Washington 5, D.C., has announced the publication of Chemical Safety Data Sheet SD-33 on Chlorosulphonic Acid. The manual sets forth physical and chemical properties of the acid, outlines handling procedures and recommends personal protective equipment in addition to covering health hazards and their control. The manual costs 20c.

* * *

A SPANISH chemical industry directory (Anuario de la Industria Quimica Española), is about to be published by the Vertical Syndicate of Chemical Industry, Hermanos Becquer, Madrid. Its sections will include, in addition to names of manufacturers, products and plant makers, a good deal of background matter relating to the industry in Spain.

[Courtesy of Read's Ltd

Examples of American-type pails made in the U.K. for export of paints and a variety of other materials. The patented handles may be packed separately to save shipping space

A NEW patent (No. 2,433,989), providing a means for automatically supplying distilled water to storage batteries, has been made available for licensing or sale through the United States Patent Office by Hans J. Hansen, 343 North Lorel Avenue, Chicago, Illinois. It concerns an automatic filling device for replenishing distilled water to storage batteries to maintain the battery grids submerged in the electrolyte at all times. The device, in a transparent container, employs an automatic valve which opens to establish water passage to the cells and closes when the cells are filled.

* * *

FOR spot welding the heavier gauges of sheet metal a machine embodying many new features has been designed by Philips Electrical, Ltd. Special merits of this type, E.1201, are: electronic control of the welding time incorporated in a control panel; offset secondary arms, as required for easy manœuvrability of assemblies; welding speed up to 80 spots per minute, single or repeat spot welding, as required; fully enclosed self-lubricating control gear; and heavy duty water-cooled trans-

(continued at foot of next page)

Radioactive Isotopes and Industry

U.S. Commercial Review of Applications

RADIOACTIVE isotopes have two main fields of industrial use, of which the first is as an atomic tracer. This application offers two possibilities attainable in no other fashion—the easy detection of unweighable quantities of material (often down to a few parts per billion with an accuracy of one or two per cent), and the non-destructive differentiation of chemically identical atoms, which enables the course of the atoms to be followed through a system.

The second field of application is the utilisation of radioisotopes as compact portable sources of radiation. The radiation can be used for its effect on materials, for example, to ionise air and thus dissipate electrostatic charges, to excite fluorescence (luminous paint, standard light source), to ionise the gas in discharge tubes, etc.

Alternatively, the effect of the environment on the radiation can be put to use. For example, gamma-ray-emitting radioisotopes can we used in place of X-ray in the practical applications of radiography.

The absorption of radiation by matter is proportional to the thickness of the matter, and a thickness gauge can be built utilising this principle. If the radiation is such that a material stops it entirely, the area of the material may be measured.

Radiation is scattered by solids or liquids; this principle can be utilised in a large number of instruments such as thickness gauges, density gauges, etc.

Finally, a good many applications have been made of measuring displacements of a radioactive source through variations in ionisation current produced. Microbalances, micrometers, etc., have been designed on this principle.

These facts and other pertinent information are contained in a new 17-page booklet entitled "Industrial Uses of Radioactive Materials," now available free of charge from Arthur D. Little, Inc., chemists and engineers, Cambridge 42, Massachusetts, U.S.A.

TECHNICAL PUBLICATIONS

(*continued from previous page*)

former with caster copper secondary. The equipment is described in an illustrated brochure now available.

* * *

THE leading article in the current No. 4 of the Sulzer Technical Review deals with air conditioning in the textile industry, and reviews theoretical principles with a description of the methods applied and their merits. A second article examines the demands which the gas-turbine designer must make on highly heat-resisting steels, and the practical means available for determining strength properties after long working periods. Such steels are remarkable for their inclination to brittleness, which—as experiments carried out in the Sulzer laboratories have shown—is closely related to the rate of creep.

* * *

A FURTHER addition to the series of British Standards relating to chemicals for electroplating has just been published by the British Standards Institution. B.S. 1561, which relates to silver anodes and silver salts for electroplating, describes the composition and maximum limits for insoluble matter and methods for determining the percentage of silver present and the quantity of insoluble matter.

* * *

POLISH experience gained from the first modern calcium carbide furnace to be established since the war, is described in an article by Inz. Jerzy Ruszkowski in No. 2 of *Przemysl Chemiszny*. The furnace, using a continuous electrode of 10 mK power, instead of a fixed one as in the older types, is stated to effect considerable economies.

* * *

THE marked suitability of aluminium and aluminium alloy for electrical conduit and fittings is underlined in the latest leaflet issued by the Aluminium Development Association. The mechanical protection and electrical bonding provided by these materials is set out and methods of installation are described.

* * *

THE Newspaper Press Directory, founded in 1846, has been purchased by Benn Brothers, Ltd., from C. Mitchell & Co. The 1949 edition will be published in the autumn from Bouverie House, Fleet Street, and future editions will be edited and managed by the *Newspaper World*, of the Benn group of journals.

◆ HOME ◆

Perbunan Becomes Paracril

The name of the oil-resistant nitrile synthetic rubber and plasticiser for vinyl and phenolic resins currently marketed by the Anglo-American Oil Co., Ltd., under the name Perbunan has been changed to Paracril.

Private Control

Mr. Leslie Shaw, a Manchester accountant, director of 18 companies, has acquired control of the Birchenwood Coal and Iron Company, Stoke-on-Trent, which supplies Stoke with gas. He is stated to have secured control with a £330,000 deal after the Coal Board had dropped negotiations.

Coal Production

There was a fall last week in Britain's deep-mined coal production of 140,200 tons, due, apparently, to the beginning of the summer holidays, although it was 168,300 tons more than in the corresponding week of last year. Comparative figures are:—Last week: 4,051,000 tons (3,762,600 tons deep-mined, 288,400 tons opencast). Previous week: 4,203,400 tons (3,902,800 deep-mined, 300,600 opencast).

Dust-Free Air

In the report of the new radiochemical laboratory at the Atomic Energy Research Establishment, Harwell, issued by the Ministry of Supply recently, it was stated that the maximum rate of flow of dust-free air was equivalent to 120 complete changes per minute in a laboratory; under normal conditions the rate would not exceed 40 changes per minute. A correction from the Ministry states the figures were intended to be per hour in both cases.

Chemistry Training Prospectus

Representative facilities for training for degrees and distinctions in chemistry and other science subjects are described in the current prospectus (1949-50) of the department of chemistry and biology of the Acton Technical College. Many of the courses have been reorganised and attention is drawn to the new post-graduate courses and to the courses in chemistry and technology of plastics. A course for the Higher National Certificate in Chemistry in September, 1949, has also been arranged.

Stabilised Prices

Members of the Associated Dynamo and Motor Manufacturers in pursuance of their policy, announced over a year ago, of supporting the Government in stabilising prices, have decided not to increase prices of a.c. and d.c. motors beyond their present level.

Oil Drilling near Mansfield

The D'Arcy Exploration Company, a subsidiary of the Anglo-Iranian Oil Co., Ltd., is to make a test drilling on the outskirts of Mansfield, 12 miles from its oil field at Eakring. It is hoped to strike oil within about 3 months, before drilling reaches 2300 ft.

Oiticica Oil Price Drastically Cut

One of the largest of recent reductions in the official fixed prices of industrial vegetable oils is announced by the Ministry of Supply, to take effect on Monday next (July 18). From that date, oiticica oil, which has been fixed at £150 per ton, will be distributed by the Ministry at £100 per ton.

Coalite Refinery Progress

After unavoidable delay due to difficulty of obtaining building materials the first two new sections of the refinery of Coalite & Chemical Products, Ltd., have been put to work and a third will be ready next month. It is hoped that these additions will considerably increase refining flexibility, and by the introduction of new products will help to counter the keener competition and changed market conditions, which are referred to in the annual report of the directors.

Industrial Statistics

A formal group of the Royal Statistical Society, the South Wales Group, has now been inaugurated under the chairmanship of Dr. T. V. Starkey of the Technical College of Monmouthshire. The Industrial Applications Section, to which it is attached, is concerned with the application of statistical techniques to all aspects of industry, including industrial research, development and manufacture, and inspection and more efficient production. The secretary of the section is Miss J. Keen, G.E.C. Research Laboratories, Wembley, Middx.

PEOPLE IN THE NEWS

Non-Ferrous Metal Appointments

THE following officers have been appointed by the British Non-Ferrous Metals Federation for 1949-50: President, and chairman of the executive committee, Mr. William H. Henman (past-president is Mr. Horace W. Clarke); vice-presidents, Mr. W. J. Terry and Mr. H. E. Jackson; treasurer, Mr. A. L. Johnson.

Mr. Dennis Rider has been appointed secretary of the British Chemical Ware Manufacturers' Association, Ltd.

Sir Graham Cunningham, K.B.E., chairman, Triplex Safety Glass, Ltd., and Quickfit and Quartz, Ltd., has been appointed first chairman of the Dollars Exports Board, registered last week as a company limited by guarantee "to examine all means whereby dollars may be earned or saved."

Dr. Erwin H. Amick, Jr., associate professor of chemical engineering at Columbia University, New York, is on a three-months' visit to Germany, where he will act as consultant to the U.S. Army on the breaking up of the I.G. Farbenindustrie monopoly.

Dr. J. G. Davidson, president of the Carbide and Carbon Chemicals Corporation, New York, was one of the six foreign honorary Fellows elected at the last meeting of the Royal Society of Edinburgh.

Mr. D. B. Pinkney has been appointed assistant managing director of Short & Mason, Ltd., scientific instrument makers, London. He was with the firm's industrial application engineering department for several years prior to the war, and returned to the organisation in 1946 in the same capacity.

Next Week's Events

TUESDAY, JULY 19

Institution of Electronics

Manchester: College of Technology. Fourth annual Electronics Exhibition organised by the north-western section (until July 21).

WEDNESDAY, JULY 20

British Association of Chemists

Cambridge: 2.30 p.m. Visit to Cavendish Laboratory. 6 p.m. Physical chemistry building, H. L. Howard: "The Organisation of Chemists."

KING GEORGE'S HOUSE

Duke Re-opens John Benn Hostel

THE Duke of Gloucester, in the presence of a representative gathering of friends of the John Benn Boys' Hostels Association, on Monday performed the official re-opening of King George's House, Stockwell, now the only hostel administered by the association. The premises were badly bombed in 1941, but two wings and the common room have been restored, providing accommodation for 100 boys hitherto housed at the John Benn Hostel, Stepney. The latter is being disposed of to Dr. Barnardo's, the council having reluctantly decided that funds permit of the running of only one hostel.

The Duke was received at the entrance to King George's House by the Mayor of Lambeth (Councillor W. H. A. Porter) and Sir Ernest Benn. In an address of welcome, Sir Ernest recalled that it was the quality and success of the association's work at Stepney which attracted the attention of King George's Jubilee Trust (of which His Royal Highness is president) and led to the decision that the work must be extended. Money was provided by the trust and the obligation put upon the association to buy and equip that fine building, which H.M. the King opened a little more than 12 years ago.

The Duke of Gloucester, responding, expressed the hope that the remainder of the building would be restored and made available as soon as possible. During the past 21 years, he recalled, more than 1000 boys had passed through the hands of the association and he hoped that in future many more would enjoy similar benefits. He wished the boys now in the hostel a happy future and a life of service to the country. He declared the house re-opened, with the hope that it would give long and useful service.

A vote of thanks to the Duke was proposed by Dr. J. J. Mallon, Warden of Toynbee Hall, and seconded by the Mayor of Lambeth. Afterwards the Duke was accompanied by some of the boys on a tour of the building and stayed to tea.

Obituary

Mr. Samuel Renton, 70, a retired industrial chemist and a well-known Cheshire Freemason, Hartford, near Northwich, was taken ill while playing bowls on July 5 and died before the arrival of a doctor.

◆ OVERSEAS ◆

Cellulose from Sugar Cane

An Argentine company is reported to be contemplating the installation in Tucuman of a cellulose factory to use local sugar-cane fibre for the large-scale manufacture of paper.

German Chemicals for Turkey

An agreement has been reached by Turkey with the Anglo-American occupation authorities in Germany for a delivery of German pharmaceutical products worth approximately £250,000. Delivery will be made in instalments, owing to shortage of foreign currency

New Punjab Oil Source

A new oil well in Pakistan has been producing 75,000 gal. daily for the past week, and production is expected to exceed 100 gallons a day, an official of the Burmah Oil Company disclosed on July 5. The company is drilling near Rawalpindi in the Punjab.

Fertiliser and Acid Plants Wanted

The official Uruguay Instituto de Quimica Industrial has invited tenders for the construction of two chemical plants, one to produce 20,000 tons of superphosphate annually, and the other 2000 kilos of hydrochloric acid daily. Offers to be presented to the offices of the Institute at Calle Bernabe Caravia 3797, Montevideo.

Argentina's Steel Plant

A steel plant to produce 700,000 to 900,000 metric tons is to be erected with United States technical aid and management assistance at the Argentine port of San Nicholas. The company concerned is the Armco International and it is reported that the U.S. Department of Commerce has granted export licences for the steel required in the construction of this plant.

Ceylon Copra

A delegation from the United Kingdom is due in Ceylon at the end of this year to discuss with representatives of the Government of Ceylon a fresh copra contract to replace the existing 1948 one. Under the present agreement Ceylon has to sell to the United Kingdom Government copra and/or oil equivalent to 40,000 tons in terms of oil during this year at the rate of £55 per ton of copra f.o.b. Ceylon ports. The Pakistan Government gets from Ceylon under the 1948 agreement 8000 tons in terms of oil and/or copra or coconut.

Refractories from Chile

An American firm proposes to install a plant at Conçepcion, Chile, for the manufacture of refractory materials on a scale to satisfy local demand and leave a surplus for export. Chilean cement and nitrate interests are collaborating.

American Sulphur Record

The U.S. domestic sulphur industry produced 396,447 long tons of native sulphur during April. This is the largest April production on record. Sales of some 449,729 long tons were also a record for April.

Rayon Plant For Uruguay

American and Uruguayan interests are reported to be planning the erection of a rayon plant at Paysandu, Uruguay, at a cost of approximately 10 million Uruguayan pesos. The new plant is intended to have an annual capacity of 3 to 4 million lb. of yarn. The New York firm of Oscar Kohorn Co., Ltd., is to participate in the undertaking.

French Blast Furnaces for Yugoslavia

In a recently concluded trade agreement between France and Yugoslavia—bringing about a mutual exchange of goods valued Fr. 6 milliard within the first year—France is to supply capital goods, including new blast furnaces as well as iron and steel products. In return Yugoslavia is to send foodstuffs, timber and tobacco.

New Canadian Titanium Process

The discovery of a new process for the extraction of titanium oxide more cheaply than the present American process is announced by experts of the Dominion Magnesium Company, Renfrew, Ontario. Half the world's supply of titanium is believed to exist in the Allard Lake (Quebec), where it is estimated there are 250 million tons of ore, possibly more, which will be developed by a subsidiary of the Kennecott Copper Company.

Bolivia's Sulphuric Acid Plant

Production has now begun at the new sulphuric acid plant, La Paz, Bolivia, which was completed in April this year. The plant, stated to have cost $71,400, was planned in 1944, but work did not begin on it until August, 1948. Consumption of sulphuric acid in Bolivia is estimated at between 300 and 600 tons annually. It is expected that the new plant, with an initial output of 1 metric ton daily, rising to 1½ tons daily, will be able to supply the most essential needs.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Electronic Products (Glos.), Ltd., Gloucester. (M. 16/7/49.) June 13, £6000 debenture, to J. J. Denny, London; general charge. *£4020. April 30, 1948.

Henry Heaton & Co., Ltd., Bradford. (M., 16/7/49.) June 8, by order on terms, charge, to Newcastle-on-Tyne Permanent Building Society securing £3750 and any other moneys, etc.; charged on land and buildings known as Springfield Soap Works and garages adjoining at Mumford Street, West Bowling, Bradford.

Reynolds Scientific Glass Works, Ltd., London, S.W. (M., 16/7/49.) June 8, £1800 (not ex.) charge, to Lloyds Bank, Ltd.; charged on 53 Hanworth Road, Sunbury-on-Thames. *£375. April 20, 1949.

Company News

Coalite and Chemical Products, Ltd.

Credit balance on the profit and loss account for the year ended March 31, amounted to £378,944, to which has been added sundry income from investments, totalling £5059, making a gross figure of £384,003. Group net profit for the year was £151,932. A final dividend of 2 per cent on ordinary stock is proposed.

The following increases in registered capital are announced: Tricana, Ltd., from £100 to £5000; Egyptian Chemical & Drug Industries, Ltd., from £50,000 to £60,000.

The address of Voss Instruments, Ltd., has been changed to Faraday Court, High Street, Maldon, Essex.

New Companies Registered

Bury Solvents, Ltd.

Private company. (470,452). Capital £1000. Manufacturers of solvent oils, chemicals, fertilisers, colours, glues, varnishes and compositions, etc. Directors: R. A. Ramage and C. Ramage. Reg. office: 36 Bolton Street, Bury.

Dollars Export Board

Registered July 4 (470,455), as a company limited by guarantee without share capital and with 20 members. To initiate and co-ordinate proposals for new activities and for increasing existing activities in the Canadian and United States and other dollar markets; to examine means whereby dollars may be earned or saved; and to consult with trade associations and Government departments, etc.

T. W. Fields (Chemists), Ltd.

Private company. (470,556). Capital £4000. Manufacturing chemists. Directors: C. W. Simpson, K. Simpson. Reg. office: 9 North Bar Within, Beverley, East Yorks.

Firmenich & Company, Ltd.

Private company. (470,401). Capital £10,000. Manufacturers of chemicals. Director: A. Firmenich. Solicitors: Denton Hall & Burgin, 3 Gray's Inn Place, W.C.1.

G. Samuel Mason (Chemical Engineers), Ltd.

Private company. (470,508). Capital £5000. Objects: To acquire the business of a consulting chemical engineer, etc., now carried on by G. S. Mason, at 25 Devonshire Street, Keighley. Directors: G. S. Mason, F. M. Mason and G. F. P. Mason. Reg. office: 25 Devonshire Street, Keighley.

Taragene, Ltd.

Private company. (470,477). Capital £1500. Industrial chemists. Directors: E. Wild and F. H. Wild. Reg. office: Llan Pentre, Old Colwyn, Denbigh.

Union Crystalex Gelatine, Ltd.

Private company. (470,600). Capital £100. Manufacturers of chemical foods. Director: A. A. Boucher. Reg. office: Cransley Works, Garrett Street, Golden Lane, E.C.1.

Chemical and Allied Stocks and Shares

THE stock market showed little business early this week, influenced by the Parliamentary debate on economic affairs, and British Funds were inclined to lose ground. The latter effect is associated with the knowledge that further 3 per cent Gas Stock would be issued as compensation. Industrial investments generally were firmer, particularly those industries capable of earning dollars.

Copper, tin and shares of other base metal mines were inclined to lose part of earlier gains, the decision to keep the London Metal Exchange closed affecting sentiment. Copper and other metal prices have again been reduced to bring them into line with those in the U.S.; and it appears that bulk buying of metals in a falling market is likely to result in a big loss which will have to be met by taxpayers.

Reflecting the general trend in industrials, chemical and kindred shares have shown small irregular movements, although gains of a few pence predominated. Imperial Chemical firmed up to 44s. 1½d., Monsanto have been firm at 50s. and Albright & Wilson 6d. " off " at 27s. 9d. Boake Roberts were steady at 30s. and Brotherton 10s. shares changed hands around 20s. F. W. Berk 2s. 6d. shares were 13s., Amber Chemical 2s. shares 5s., and Pest Control 5s. shares eased to 8s. 1½d. Sanitas Trust 10s. shares were 26s. 3d. and B. Laporte 5s. shares changed hands around 20s. still affected by the share bonus news. Among preference shares, L. B. Holliday 4½ per cent were 21s. 9d., W. J. Bush 5 per cent 24s. 9d. and British Chemicals and Biologicals 4 per cent 20s.

United Molasses at 39s. and the 4s. units of the Distillers Co. at 26s. 6d. were favoured among shares of companies which are important dollar earners. Turner & Newall were also better at 73s. 3d., Borax Consolidated kept at 50s., British Aluminium were 43s. 9d. and British Oxygen (92s. 9d.) turned firmer. Later, however, prices eased again.

British Glues & Chemicals 4s. ordinary were fairly steady at 18s., with the 8 per cent participating preference at 38s. 1½d. Earlier in the week hopes of reopening of the London Metal Exchange put Amalgamated Metal shares 1s. up at 18s. 3d. while Metal Traders gained 2s. but later news caused much of the earlier gains to be lost. A steadier tendency continued in iron and steels, Dorman Long being 29s., United Steel 26s. 7½d., Stewarts & Lloyds 53s. 6d. and Guest Keen 37s. 6d. Babcock & Wilcox were firm at 57s. 9d. " ex rights " to the new shares.

Boots Drug recovered to 49s. 3d. in anticipation of the full results and chairman's annual statement, but Beechams deferred fluctuated around 12s. 3d., awaiting the dividend announcement. Sangers were 29s., British Drug Houses 5s. shares changed hands around 7s., and in other directions, Glaxo Laboratories were £17¾ . Shares of companies with plastics and allied interests remained uncertain, De La Rue at 26s., British Industrial Plastics 2s. shares 4s. 6d. and Briitish Xylonite 67s. 6d. Elsewhere, Coalite & Chemicals 2s. shares were 2s. 1½d.

British Chemical Prices

Market Reports

A MODERATELY active interest continues to be sustained in the chemicals market this week, with the movement to the textile, plastics and other consuming industries covering reasonably good volumes for the time of year. Overseas inquiry, particularly for Empire destinations, has again been good and the improvement in supplies is well maintained. Prices have shown no further changes of importance on the week but reductions in prices of non-ferrous metal compounds may be expected shortly as the result of the decrease in the controlled prices of the metals. A brisk inquiry has been reported for caustic soda, soda ash and bicarbonate of soda, and the soda products generally continue in good request. There is nothing fresh to report concerning the potash compounds.. Other items for which there is a good demand include borax, bleaching powder and hydrogen peroxide. Quiet conditions prevail on the coal-tar products market and competition in the export markets is keener.

MANCHESTER.—When allowance is made for the continued effect of holiday stoppages at consuming works, trading conditions on the Manchester chemical market may be described as reasonably satisfactory, from the point of view both of the movement of supplies into consumption and the volume of replacement business in the home section of the market. Users are calling for steady deliveries of caustic soda and the other alkalis and also of a wide range of other chemicals, while a fair amount of new inquiry on export account continues to be dealt with. Few fresh prices changes of any consequence fall to be recorded. In the fertiliser market trade generally is at a seasonally low level, and in the tar products section many lines are meeting with no more than a moderate demand.

GLASGOW.—The volume of business being transacted in the Scottish chemical market is now on a reduced scale, due to the holiday season. No particular demands have been noted and it is not likely that there will be much activity for a few weeks. The downward trend of prices has continued. The export market is also quiet.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Dispersion of carbon black.—J. M. Huber, Inc. Nov. 28, 1945. 622,664.

Utilisation of atmospheric or gas pressure to augment power units.—F. J. H. Phillips. Aug. 13, 1946. 622,665.

Process for manufacturing pipes and other hollow bodies of plastic material.—E. V. Fejmert. Aug. 20, 1946. 622,831.

Protective device against poisonous gases and dust for factory and like workers.—M. Christensen. Aug. 23, 1946. 622,486.

Electrical insulation containing synthetic resin.—I.C.I., Ltd., A. A. Drummond, and B. Jacob. Sept. 13, 1946. 622,671.

Manufacture of synthetic resinous condensation products.—I.C.I., Ltd., D. Atherton, and W. Charlton. Oct. 2, 1946. 622,675.

Electrolytic polishing of silver.—Westinghouse Electric International Co. July 20, 1945. 622,750.

Coloration of yarn or fabrics composed wholly or partly of secondary or acetone-soluble cellulose acetate.—T. E. Marchington & Co., Ltd., and G. D. Sutton. Oct. 8, 1946. 622,676.

Treatment of waste laundry effluents.—A.S.P. Chemical Co., Ltd., C. L. Walsh, and B. A Adams. Oct. 23, 1946. 622,494.

Treatment of laundry and the like trade effluents.—A.S.P. Chemical Co., Ltd., C. L. Walsh, and B. A. Adams. Oct. 23, 1946. 622.495.

Method of stabilising dried starch syrup.—T. Nordenskjold, and E. A. Johnsson. Dec. 10, 1945. 622,687.

Production of alkylated phenols.—Firestone Tyre & Rubber Co. March 8, 1946. 622,690.

Processes and apparatus for treating sewage.—G. R. Scott (Electrical), Ltd., and G. P. Scott. Dec. 12, 1946. 622,691.

Esters of alphaformylphen-aceturic acid.—Merck & Co., Inc. Dec. 21, 1945. 622,504.

Phenol-aldehydeamine condensation products.—Bakelite Corporation. Jan. 8, 1946. 622,758.

Liquid atomising methods.—J. J. Estignard-Bluard. Feb. 2, 1946. 622,759.

Apparatus for the manufacture of chemical substances.—I.C.I., Ltd. (African Explosives & Chemical Industries, Ltd.). Jan. 14, 1947. 622,697.

Process for the manufacture of pentaenes.—Roche Products, Ltd. (Hoffmann-La Roche & Co., A.G., F.) Feb. 20, 1947. 622,510.

Treatment of liquids with gases or vapours.—I.C.I., Ltd., and O. G. Dixon. Feb 21, 1947. 622,706.

Aqueous emulsions, latices, or dispersion of polymers and interpolymers of vinyl chloride.—I.C.I., Ltd., and A. K. Sanderson. Feb. 21, 1947. 622,511.

Methods of preparing hydrocarbon-substituted halogenosilanes.—British Thomson-Houston Co., Ltd. March 18, 1946. 622,516.

Coal-treating solutions.—B. G Robertson. Nov. 4, 1946. 622,517.

Process for producing pigmented rubber.—Harmon Color Works, Inc. Feb. 8, 1944. 622,518.

Process for the manufacture of α-γ-ribonic-acid lactone.—F. Hoffmann-La Roche & Co., A.G. April 2, 1946. 622,529.

Manufacture of ultra-violet transmitting high silica glass articles.—Corning Glass Works. March 28, 1946. 622,530.

Electrodeposition of nickel, and electrolytic cells.—Mond Nickel Co., Ltd. April 12, 1946. 622,531.

Process of producing diphenylacetonitrile and the product resulting therefrom.—E. Lilly & Co. July 15, 1946. 622,559.

Process for extracting gallium oxide from aluminous substances.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Dec. 30, 1946. 622,560.

Manufacture of di(alkoxyphenyl) haloethanes.—I.C.I., Ltd. March 27, 1946. 622,561.

Production of antibiotic substances.—Boots Pure Drug Co., Ltd., R. Michaelis, and D. A. Peak. March 27, 1947. 622.564.

Process for reclaiming vulcanised rubber scrap.—United States Rubber Co. June 5, 1946. 622,576.

Heat-treatment of metals.—Communications Patents, Ltd., and R. L. Stephens. March 28, 1947. 622.577.

Bright nickel plating.—W. W. Triggs. (Harshaw Chemical Co.). March 31, 1947. 622,761.

Mixing or agitating apparatus.—E. J. G. Huybreghs. April 8, 1946. 622 590.

Method of heating or hydration of fibrous cellulosic material. H. E. Anderson. April 2, 1947. 622,718.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Governments and Scientists

FEW forces have a more unifying effect than the candid recognition that there are at work powerful influences or groups designed to disrupt the things we know and respect. That deeply rooted human characteristic had its outstanding example on the grand scale in this country after 1939. The same familiar trend on a smaller scale has been discernible for some time among the scientific workers of many countries and the portents, as time goes on, become more conspicuous.

The growth of the perception among an increasingly large number of scientists that the principles that have been at the root of all reputable scientific inquiry in the past are now being sedulously undermined in one part of the world has found expression in the resignation in different countries of distinguished foreign members of the Soviet Academy of Sciences, and in the many testimonies to the truth of the fundamentals which Moscow and its satellites are so anxious to uproot.

The malaise which has given rise to this spontaneous resistance is now being seen by some as the manifestation—in its most virulent and repulsive form—of a current readiness in a very much wider field to engulf the scientist in the machinery of government. That, briefly, is the disturbing fact to which Sir David Rivett so effectually directed the attention of Society of Chemical Industry members in Manchester last week in his parting address as president, before handing over the principal office. He had in mind chiefly the recent course of events in Australia, where the Council for Scientific and Industrial Research—for which he is the best qualified spokesman—has now been taken very directly under State control and may have lost some of its essential liberty to use its own initiative in promoting the best deployment of science in the interests of Australian industry. The future for the CSIR still remains in the balance. Given liberal and unbiased treatment by the Government departments to which it now appears to be in some important respects subordinate, there is no reason to expect that its great work for Australian agriculture and industry by the practical application of science to urgent material needs will be impaired.

There is, as the distinguished Australian did not fail to point out, good reason to hope that the transfer to the Government of the supreme authority in such matters as directing the course of research and the appointment of officers will not be followed by excesses of administrative zeal and the imposition of a smothering network of red tape. The disturbing fact remains that in Australia the most active group

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of scientists have been deprived by legislative action of their authority, hitherto unchallenged, to direct their work in the light of their own observation of industry's needs, allied with their specialised knowledge of the newer aids which the sciences can proffer.

The forces which brought this result in Australia are not exclusively Australian. In England and all the Commonwealth countries, where science has reached an advanced stage, war made willing recruits of virtually all scientific workers, and the habit of command once it is acquired by governments is not lightly laid down. Their authority, as Sir David Rivett has observed, may gain public assent from the movement in opinion, coloured by some of the more sensational war-time results of the work of scientists operating in spheres not of their own choosing.

"The remarkable achievement of physicists and engineers in applying nuclear energy to purposes of war begot not only wide astonishment at, and admiration for, the work of these men," recalls Sir David Rivett. "It bred also an intense satisfaction that such developments should have occurred in *our* camp rather than in that of the enemy. Along with that, however, came an emphatic desire to ensure that the use of the new engine of war should be denied for as long as possible to any potential future enemy. . . . No longer is attention limited only to the engineer's product of applied science. So has crept into men's minds, naturally enough, a feeling that all scientific work, even if it appears only remotely associated with war technology, must be closely guarded, controlled, in greater or less measure kept out of view; and even its directions of development kept under supervision. . . . If possible I want while here to find out more about your attitude to the problems that are involved, to see how you are tackling them, to learn how you view the attitudes of other countries to them; perhaps even to ask whether it would not be well to aim at some measure of uniform action within the Commonwealth to guard against common dangers to our own science and its associates."

It would be very revealing to know what answers have been given here to the inquiries of Australia's principal scientist. The dangers which he has recognised in his own sphere and which have materialised in a more extreme form in the U.S.A., sanctioned by the urgent demand for security in regard to atomic energy, are not wholly remote

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Notes and Comments

No More "Bargains"

THE see-saw of base metal prices, which produced the rapid downward and upward movements, all within the space of a few days last week, has fairly certainly not yet been firmly grounded. When we called attention in these notes last week to the alacrity with which the Ministry of Supply repented its first liberal impulse to supply electrolytic copper at around £104 per ton (and added a supplement of £3 10s.) the position of lead, which the Ministry had just reduced to £75 10s., was anything but stable. We said as much and speculated whether the Ministry had noticed what was going on in the U.S.A. It had, rather belatedly perhaps, and before that issue of THE CHEMICAL AGE had appeared had swiftly withdrawn its short-lived "bargain offer" for good soft pig lead, raising its price from £75 10s. to £81 per ton—£1 less than the rate which prevailed earlier. These afterthoughts largely reversed the easier conditions which appeared to be developing for the numerous chemical and metal industries depending upon the three commodities mentioned in the Ministry's first memorandum, except in respect of zinc, which was permitted to stand at £58 per ton (instead of £78). The sequence of events, however, had evidently not ended, as buyers feared, watching the upward movement of U.S. spot zinc prices this week . By Tuesday the Ministry of Supply had noticed that, too. Good ordinary brand zinc was hurriedly raised to £60 15s. per ton.

Lucky Strike

RECALLING the emphasis which has been laid last week and this, during the current fourth Empire Mining and Metallurgical Congress, on the need for the fullest collaboration of scientists to discover and exploit the world's mineral resources, a story currently to hand has a quaintly irrelevant flavour. It describes an accidental discovery of considerable deposits of manganese ore and is related by United States geologists, in a bulletin just released by the U.S. Geological Survey. It refers to the discovery of rich deposits of high grade ore, possibly amounting to more than 7 million tons, in the Serra do Navio District of the Amazon River Valley, Brazil. Samples from the site appear to indicate that the ores average about 50 per cent pure manganese. The discoverer is said to be Mario Cruz, a woodsman, who, prospecting for gold in 1941, picked a small rock from the shore as ballast for his canoe on the dangerous voyage down the Araguari River to Porto Grande. He later discarded and forgot the rock until 1946 when a Cleveland, Ohio, company began to prospect for iron in the region. Cruz recalled the incident of the piece of rock and took it to the governor of the territory, thinking it was iron. Samples were sent to Rio de Janeiro, where analysis showed it to contain 55 per cent manganese.

A Petroleum Anniversary

AS the latest developments in petroleum chemistry become accomplished facts and multiply it is hard to believe that the source of all this is rooted in an industry not much more than 50 years old. Effective petroleum industry in Great Britain is as young as that; in 1899 our total mineral oil imports were 240 million gallons—enough to keep alight some few million smoky oil lamps and provide lubricants for some of our industrial machinery. Benzene for the first motor cars was so rare that the Automobile Club was distributing special maps showing where the few precursors of the filling station were located. The great field of petroleum chemistry had not been visualised. This near-miraculous growth is called to mind in a story which recreates much of the colour and records all the relevant facts of the modern ages of petroleum, admirably assembled by *The Petroleum Times,* which has just celebrated its 50th year of continuous publication. It is the oldest oil journal in the world and can claim to have seen and recorded every significant phase in the industry, excepting, of course, those associated with the venerable Scottish shale oil workings, which were very active 50 years before *The Petroleum Times* saw the light. Its anniversary issue is replete with interest, even for those who are not oil technologists, and deserves to stand as a monument and a record of the struggles which have lead up to the growing wealth of oil products and petroleum chemicals. Already oil is Britain's largest export, of which the great refinery and chemical programme promises important increases.

Promising Coal Research

A REVEALING comment on one effect of colliery nationalisation on coal technology was offered last week to some of the delegates of the fourth Empire Mining and Metallurgical Congress, who visited the private laboratories in London where the Powell Duffryn Technical Services is carrying on what is probably, from the chemical standpoint, the most important coal research in this country. It is designed to promote the much fuller use of the rich chemical derivatives of coal, the need for which was underlined by the congress president, Sir Henry Tizard, at the conclusion of the tour. " No one," he said, " can see a limit to what can be found out, of use to civilisation, by continuous study of the properties, the composition and the by-products of coal." Powell Duffryn, he reminded the congress delegates, had been put out of business as coal owners by nationalisation and had determined to devote its great technical experience and energies to research for this country and those of the Empire. Its laboratories, amply equipped and staffed, and research programme promise to produce important changes in the field of most coal chemicals.

Broadcast Science

THE interest of the layman in scientific matters and his desire for information and explanation of contemporary developments have never been so marked as they are now. That seems to have been recognised in the current inauguration by the B.B.C. of another series of six talks on " New Frontiers in Science " which was opened by Prof. N. F. Mott, Melville-Wills Professor of Theoretical Physics, Bristol University, with his talk last week on " What We Are Doing with Electrons." Chemistry gets a very fair share of attention in the subsequent talks. The second will be by Dr. Patrick Grove, director of the Radiochemical Centre, Amersham, who will explain how nuclear energy is helping to solve many chemical problems. The discovery of the connection between genes and inheritance will be the subject of the fifth talk by Prof. C. H. Waddington, Professor of Animal Genetics, Edinburgh University. The series, which Prof. Eric Ashby, of Manchester University, will sum up, shows in its composition a very lively sense of what is news and what is most useful to complement the meagre general information on topics likely to figure often in future affairs.

GOVERNMENTS AND SCIENTISTS

(*Continued from page* 106)

from scientific affairs in the United Kingdom. Never have the sciences had so many friends in high places. The interest shown by members of the Government is at the moment wholly benevolent and facilitates the continuance of a very substantial financial support for science projects and education. There is, however, almost inevitably a strong disposition to effect practical improvements, of which the Development of Inventions legislation is an example, and the temptation to exert a greater measure of paternal control over the " productivity of impractical scientists " will be hard to resist. No results of that spirit are fortunately yet observable in the wide ranging programme of, for example, the DSIR. But such reassurance does not absolve those who share Sir David Rivett's embracing view of the responsibilities of scientists from emulating some of his vigilance.

FOOD AND METALS

Interrelated Studies by DSIR

THE far ranging character of the investigations necessitated by the Department of Scientific and Industrial Research studies of foodstuffs is disclosed in the currently issued report (for 1947), " Food Investigation " (HMSO, 6d.).

The close relationship between the behaviour of some metals and successful food preserving accounts for the inclusion of an interesting note on the oxidation of aluminium.

The report observes that a highly resistant film of oxide can be formed on the surface of aluminium merely by immersing the metal in boiling water. The rate at which the film forms and the time taken for its completion depend upon the purity of the metal. The action is much greater with super-pure aluminium than with lower grades of metal, probably because the latter contain more silicon; it is reduced by adding traces of silicic acid to the water. The film consists of the monohydrate of alumina ($Al_2O_3.H_2O$).

The corrosion of aluminium (90.25-99.993 per cent purities), aluminium-manganese (1.17 per cent Mn) and aluminium-magnesium-manganese (1.78 per cent Mg, 0.48 per cent Mn) alloys by 0.1 N citric acid solution increases progressively with an increase of temperature of 25° to 95°C. (77° to 203°F.) and is very rapid at 95°C. (203°F.).

The presence of 0.1 N sodium chloride in the citric acid solution has a very pronounced effect in increasing the corrosion at 25°C. (77°F.) and a small or negligible effect between 60° and 95°C. (140° and 203°F.).

Stainless Steel

The effect of citric acid, sugar and other constituents of food upon stainless steel has also been made the subject of studies. The report recalls that difficulty has been experienced in industry in finding suitable containers for warm citrus juices and syrups containing small amounts of sulphurous acid. Since most of the common metals are unsuitable for this purpose, corrosion tests designed to ascertain the probable behaviour of different types of stainless steels under factory conditions were carried out with a solution containing citric acid (4 per cent), sodium chloride (0.5 per cent), sugar (30 per cent) and 700 p.p.m. of sulphur dioxide maintained at 60°C. (140°F.). The steels fell into two classes, resistant and non-resistant, and further work is being carried out to account for this difference.

STREPTOMYCIN AND PAS

Their Use in Treating Tuberculosis

THE recent second Commonwealth and Empire Health and Tuberculosis Conference, in London, sponsored by the National Association for the Prevention of Tuberculosis, afforded some new light on " Trends in the Modern Treatment of Tuberculosis, Including Streptomycin and PAS."

Dr. Geoffrey Marshall, of Guy's and Brompton Hospitals, in his paper, said streptomycin was a treatment of great value, but with unfortunate limitations. He mentioned the Medical Research Council's trial of streptomycin, which had been carried out with scientific controls of a stricter order than ever before in the trial of any treatment for tuberculosis. Streptomycin had achieved wonderful results in tuberculous meningitis—complete recovery in 40 per cent of cases, whereas before the death rate was almost 100 per cent.

Limited Usefulness

In pulmonary cases, said Dr. Marshall, streptomycin was only useful for a short time, and only once for any one patient, owing to the development of streptomycin-resistant bacillus, but it could be an adjunct to other treatment if its limitations were realised. " Do not use streptomycin because it may be good for a patient, but only when it is indispensable."

Dr. C. J. Beckwith, of the Canadian Tuberculosis Association, reported on the use of streptomycin for the treatment of the disease in the Dominion.

PAS on Trial

Professor Lehmann, of Gothenburg, gave a description of work in Sweden with PAS (para amino salicylic acid), a new drug which is now on trial in England. He said one of the values of this drug was that it could be given in large quantities for long periods of time. A report on a group of 205 pulmonary cases showed that, in the majority of them, progressive pulmonary tuberculosis had been converted into a healing phase.

Intestinal tuberculosis cases had, said Professor Lehmann, given perhaps the most satisfactory results with PAS treatment—19 out of 20 showed definite improvement—and in 70 per cent of urogenital cases the bacilli disappeared within a year. Possibly, combined treat ment, *i.e.*, with streptomycin, might be the most successful in the end, and these drugs could not be considered as a substitute for other methods.

WASTE PICKLE LIQUOR

Prospects of More Profitable Recovery

PROMISING results from recent studies of ways of reducing the undesirable characteristics of waste pickle liquors from metal processes are among the many interesting advances made during 1948-49 by workers at the Melton Institute, Pittsburg, U.S.A. An account of this, appearing with many other records of chemical and scientific interest in the 36th annual report of the Melton Institute, discloses that the multiple fellowship studying acid recovery under the patronage of the American Iron and Steel Institute, has conferred with representatives of a number of steel companies on specific disposal problems.

Coke-Oven Ammonia

The process for treating waste pickle liquor with raw coke-oven ammonia has been carried to a point where technical details have been solved on a laboratory scale. Ammonium sulphate uncontaminated by coke-oven gas constituents can be prepared, but the high sulphur content of the iron oxide by-product indicates that this material may have to be discarded. The process awaits evaluation on a pilot-plant scale.

A study of means for improving the quality of the sludge from neutralisation of stainless steel pickle liquor has demonstrated that up to 40 per cent of its iron content can be selectively precipitated by lime slurry without co-precipitating chromium or nickel. Although this method requires a two-stage neutralisation, enrichment of the sludge in chromium and nickel may provide economic justification for it.

Further investigation, says the report, has been given to the recovery of manganese from low-grade ores by leaching with waste pickle liquor.

It has been found that the manganese can be leached practically completely in less than 30 minutes from ore ground to about 60-mesh and that, by minor changes in the leaching technique, the rate of filtration of the slurry can be improved substantially. This research suggested the possibility of recovering manganese from open-hearth slags by a similar process.

In this instance, however, a sound process could not be developed because only the free acid in the pickle liquor is effective as a leaching agent, and both silica and magnesia are leached from the slag. The silica contaminates the iron oxide by-product and the magnesia appears in the manganese concentrate; their removal has been studied and found to be impractical.

(Continued at foot of next column)

There is good evidence that the market for ferric sulphate could be expanded considerably if its cost of manufacture could be lowered. An investigation of means for converting the iron in waste pickle liquor to ferric sulphate shows promise that a successful process may be developed.

DISINFECTANT DETERGENT

High Antibacterial Value

A NEW surface-active agent, called Oronite quaternary ammonium chloride ATM-50, said to be 250 times stronger than carbolic acid, is expected to find wide use in the disinfecting and associated fields.

Made from petroleum raw materials, the cationic material is the latest addition to the growing number of quaternary ammonium compounds and is expected soon to be in commercial production by the Oronite Chemical Company, New York. Technically, it is quaternary ammonium chloride ATM-50, an alkylbenzyl formulation available as a 50 per cent aqueous solution. It is said to be non-toxic and not a skin irritant.

The new compound, according to Mr. R. I. Stirton, of the Oronite Company, inibits the growth of such organisms as *Staphylococcus Aureus* in dilutions as high as one in a million parts, and dilutions as high as one in 4500 are adequate to kill such organisms within 10 minutes. Under standard conditions ATM-50 is claimed to be more than 250 times as effective as phenol in destroying the organism responsible for typhoid fever.

Colourless and odourless and stable under all reasonable conditions of use, the solution is compatible with non-ionic detergents and various inorganic builders such as tetrasodium pyrophosphates. This compatability renders the product particularly useful in the preparation of detergent-sanitisers.

In addition to high germicidal activity, ATM-50 exhibits a high level of surface activity. A concentration as low as 0.001 per cent is said to reduce the surface tension of water to approximately one-half of its normal value, and a concentration of 0.01 per cent will reduce the interfacial tension between water and White Oil to less than one-tenth.

ECONOMICS OF COAL GASIFICATION

Results of U.S. Liquid Fuel Experiments

From OUR NEW YORK CORRESPONDENT

THE first successful full-scale test run, marking a significant development in America's research programme to develop synthetic liquid fuels from coal, has just been completed at the U.S. Bureau of Mines' new coal gasification unit at Louisiana, Missouri (THE CHEMICAL AGE, 60, 622-3, 924-5), during which some 70,000 standard cu. ft. per hour of gas were produced.

A part of the bureau's gas synthesis (Fischer-Tropsch) demonstration plant, this coal gasifier—probably the largest unit ever installed for direct production of synthesis gas from finely powdered coal and oxygen—is the second of the plant's five units to be completed. An oxygen production unit has been in operation for several months, and it is anticipated that the remaining units for gas purification, hydrocarbon synthesis, and product refining will be finished and placed in operation during 1950.

Gasification, however, is the most important cost and process problem now requiring solution before competitive motor spirit and oil can be made from coal by either of the two basic processes employed in the recently installed plants at Louisiana. In the Fischer-Tropsch process, the synthesis gas—a carbon monoxide and hydrogen mixture—obtained by coal gasification constitutes roughly 60 per cent of the cost of the liquid fuel products. In the coal-hydrogenation process, the hydrogen obtained represents 40 per cent of the product cost. Therefore, the bureau states, a low-cost gasification method applicable to all types of coal is imperative.

The new type continuous gasifier at Louisiana does not require the use of coking coals. The unit is designed to use about 28 tons of coal, 24 tons of oxygen, and 35 tons of superheated steam, and to produce some 2 million cu. ft. of raw synthesis gas daily.

In a preliminary six-hour test run conducted below design rates and below normal operating temperatures, only one of the six burner tubes was used. There was no evidence of any undesirable condition at the time of the voluntary shutdown.

Recently, as part of a 10-hour period of operation, a four-hour test was made with all six burners operating at design capacity and with gasifier temperatures averaging about 2200°F. During this period the feed rates were: Coal 2300 lb. per hour, oxygen 17,000 standard cu. ft. per hour, steam 2000 lb. per hour.

Approximately 70,000 standard cu. ft. per hour of gas were made containing: 37 per cent carbon monoxide; 42 per cent hydrogen; 16 per cent carbon dioxide: 4 per cent nitrogen; 1 per cent miscellaneous.

Bureau of Mines engineers are hopeful that they can reduce the carbon dioxide content and obtain a higher yield of still better synthesis gas in subsequent runs after they have become more familiar with the operating characteristics of the new gasifier. Considerable work remains to be done before the gasifier is put in continuous operation. However, the trial runs apparently could have been maintained over longer periods and are considered encouraging.

LEAD AND ZINC PRICES

Upward Revision of New Rates

IN view of the rise in the price of lead on the American market, the Ministry of Supply has announced that the price of good soft pig lead is increased by £5 10s. per ton (delivered)—from £75 10s. to £81. Discounts and premiums remain unchanged.

Additional charges on orders booked for delivery subsequent to the month of order, are also unchanged. The new price has effect from July 14.

On Tuesday this week the Ministry notified an increase in price of good ordinary brand zinc from £58 to £60 15s., delivered.

The Ministry also announces that in future the prices at which copper, lead, zinc and tin will be sold (subject to licence) to consumers in the United Kingdom will be the prices ruling on the date the order is posted, and not on the date the order is received at the Non-Ferrous Metals Directorate, Rugby.

Cornish Tin Company's Expansion

Geevor Tin Mining Co., Ltd., of St. Just, Cornwall, has drawn up a development programme estimated to cost £100,000.

Chemists and the Commonwealth

Great New Responsibilties—and Some Hazards

by SIR DAVID RIVETT

Sir David Rivett, part of whose presidential address to the Society of Chemical Industry is reproduced here, makes a strong case for the continued independence of scientific workers, whose decisive contribution to the development of backward areas he has studied as head of the CSIR in Australia

IT would doubtless be appropriate to focus attention mainly on specifically chemical interests; but chemists to-day probably recognise more fully than many others in the scientific fraternity how artificial have become the boundaries and sub-divisions of sciences, which have been useful enough in the past, but which are so rapidly losing all significance.

When, for example, one approaches a problem of pest insect control, may it not well be that a physicist, aided by a mathematician and guided by a chemist, will prove of more value than any other worker? We no longer grant an exclusive lease of the entomological field to those people who would regard themselves as "specialists" in the sub-division of entomology.

I shall not ride that particular hobby horse of mine which carries one to the conclusion that a chemist to-day usually finds his field in applied science to be like a paddock in North Australia—quite without boundary fences. And the farther we go the more will the sub-dividing fences in industrial science vanish and the more definitely will stand out the need for mutual aid and community attack on the problems of our time. But what are "the problems of our time"? What determines them—classifies them?

Possibly among many noteworthy changes in popular outlook which have resulted from two world wars and an intervening period of doubt, there stands out the altered attitude of people in general, and so of their rulers, towards scientific effort of every kind. We need not pretend that this is a sign of sudden widespread passion for increased knowledge of Nature; for broader culture. No one will be quite so devoid of a sense of humour as to maintain an idea of that delightful kind.

What, then, has brought it about? Perhaps if a single cause is to be sought for the contemporary general interest in scientific work, taken by such people as would have cared little or nothing for it a few decades ago, this cause can be expressed in the single word "fear"—the obsession of fear, which one meets everywhere to-day.

One sees fear influencing policies, points of view, attitudes towards individuals, relations between groups of men. And this leads naturally enough to a strong desire for an increase in power to combat the objects of fear, and logically and rightly enough, such power is sought partly in greater understanding of Nature, greater ability to divert her powers to our own selected ends.

Population and Food

For the moment, put out of mind the fear that is associated with the word war and all that it connotes. Fix attention on a peace-time problem though not because it is easier, simpler, or less dire in its possibilities than the war problem. This problem can be suggested in the two words: population and food.

I make no apology for bringing so grave a matter before a society the prime interest of which is industrial chemistry, for that is precisely where it belongs. If ever there was a subject fundamentally chemical, surely it is the study of human metabolism and all that goes to its maintenance.

On many of its main issues we are not well informed. The chemistry of foodstuffs, their direct production from the soil by reactions of fascinating difficulty, their manufacture by synthetic or other means, their changes when they enter that amazing laboratory which is the animal body, these are surely in the chemist's arena.

Therefore on him lies the grave responsibility for developments to meet a very broad human problem; and this brings us at once to a host of questions with which fundamental and applied science must grapple.

You know of the efforts that are being made at present to increase food supplies from Australia to this country and Europe, let alone to Asia. You may have heard of plans for large-scale conversion of vegetable protein and carbohydrate into animal protein and fat in the northern parts of Australia. You may have been given a delightful picture of unused grass growing waist high down there over huge areas. So it does—usually for three months out of twelve. For the remaining time there is relative famine for the herbivorous chemical converters—the sheep and the cattle.

Storage of water and irrigation are cited at once by wet-season visitors as the solution. Yet every chemist knows that water and soil do not themselves, even under right temperature conditions, suffice to yield nutritive pastures. There may be abundant apparent feed in these regions and yet cows will fail to maintain weight and condition as soon as there are added the strains of pregnancy and lactation.

It is a situation that calls for biochemists of a high order of ability; political and commercial magnates will not deal with it adequately. Indeed, it is a tragic fact that "practical" improvements, such as additional water supplies, may result in utter devastation of certain types of land. Of that, there is only too much evidence available, indicating that in the past, control has not been in the right hands.

Time does not permit me to give even the summary of specific examples which I had prepared. I must be content to name just a few.

An Organic Problem

If, for instance, anyone is looking for an attractive problem on the organic side, one can be provided in south-western Australia, in certain parts of which grave fears are entertained for the future of sheep-breeding. An unforeseen result of the wide spread of the legume, subterranean clover, has been the development of a modified strain which, if eaten by sheep in excessive proportion to grasses, causes rather profound changes in the reproductive systems of the animals. Ewes are unable to carry fœtuses to maturity, while with wethers the development of mammary glands presents an unusual phenomenon. That something of the nature of an oestrogen is produced in the clover is a suggestion. The study of it, of the reason for its occurence, of ways perhaps of preventing its production, is an attractive field for the biochemist.

Mr. Stanley Robson, 1949-50 *SCI president*

Then there is the case of tracts of country like the Ninety-mile Desert, of about 2 million acres, at the lower boundary of South Australia and Victoria. Rainfall is good; soil sandy; natural vegetation—contemptible. But chemists have shown that expenditure of a few shillings per acre on the appropriate chemicals will enable this useless terrain to develop a carrying capacity of three sheep to the acre.

An important empirical result this; but we must find out why 5s. worth of zinc or copper or cobalt salts enables us to grow 60 or 70 lb. weight of fat lamb. In the absence of such knowledge, we cannot feel certain of our ability even to conserve our newly-won productive capacity. I have no confidence in the "practical farmer" as a conservator of agricultural lands. The farmer may become a destroyer. He needs and he must have far more assistance, based on fundamental scientific knowledge, than we have yet doggedly set ourselves to provide for him. Tasks for the chemist and his associates are to be found all over the place.

I shall merely mention in passing the artesian water studies that clamour for attention; but there is one other aspect of the water problem to which one may draw brief notice. It arises in arid areas; and what an extent of them we have in the British Empire! As rocket ranges they may serve a purpose. As potentially productive regions, either under stimulated rainfall or under irrigation, they present highly attractive questions to the chemist.

One need only recall quite simply instances of effects following addition of water to systems in equilibrium in its absence, to realise the possibilities of changes in arid soils that may follow their watering.

I remember an occasion, in the Mildura region, one blazingly hot afternoon, when I suddenly came upon quite a large field covered with what from a distance looked like one of your beautiful winter morning hoar frosts; a white crystalline carpet over a ploughed surface. Analysis showed it to be nearly pure sodium sulphate.

Double Decompositions

From a complex mixture of clays, gypsum, salt and what-not in the soil, quite simple double decompositions accounted for its presence. Block after block of land has been "salted" out of production, becoming quite useless.

We know a good deal about all this now, and over the years have steadily brought back fertility to numbers of ruined vine and citrus properties; but the chemistry and physics of these heterogeneous equilibria require keener study than has yet been given to them.

[Sir David Rivett went on to describe briefly the history of the Australian Council of Scientific and Industrial Research, of which he is head, and the factors which had recently threatened to reduce its independence of scientific action.]

It is neither necessary (he continued), nor is it my intention, to talk of any of the achievements of this council of 20 scientific men who through an executive committee of three (later five) maintained close contact with the activities of a rapidly growing staff.

Although monetary expenditure is no indication of scientific success, it is perhaps pertinent to say that whereas Mr. Bruce set the council on its road with half-a-million pounds, which lasted it for six or seven years, the provision for the last single financial year amounted to two and a quarter millions, excluding funds for capital work.

Scientific Needs

The outstanding gift of successive Governments to the Australian CSIR was that of freedom to pursue its investigations in accordance with its own estimate of the scientific needs of the country and the scientific ability available to cope with them. The council was not built on the normal departmental pattern. That pattern is, I have no doubt, admirable for services in which policy and programme are laid down at the higher levels, and where successive layers of officers are there to fulfil the requirements and the orders passing down from above, in most cases originating in the ministerial stratum.

Scientific work cannot, I fear, be developed satisfactorily along that pattern.

The council was permitted to take charge of its own staffing. Its men did not come under the Public Service Act, and the Public Service Board was not responsible for the selection of staff or for laying down the terms and conditions of appointment.

The head of the Commonwealth Board in 1926, who at first opposed the suggestion that the CSIR should be outside his jurisdiction, declared some years later that the Bruce Government had taken the right line, since there would never have been the subsequent development of the CSIR had it been obliged to work under the auspices and in accordance with the procedures, classifications, etc., of his board. That board was designed for purposes very different from those to be served by the council.

[Sir David Rivett then reviewed the post-war concentration on "science, secrecy and security" which had helped to bring about a new attitude towards the administration of scientific work.]

Peacetime Activities

Actually, we in the CSIR (he continued) were concerned with but very little defence work; we had shed our responsibilities of the war years just as rapidly as possible. Under the Bruce Act our duties lay in scientific development of primary and secondary industries in peace-time; we hurried back to them, joyfully.

Therefore as early as 1947, we had urged that work related to defence technology should not be in our hands; a decision accepted by the Government and generally approved. It was agreed that the Department of Supply should take responsibility for all such activities, this department being administered under the Public Service Act.

An immediate result was to place the Division of Aeronautics under Supply, it being considered that as it was deeply interested in high speed developments, its work had more immediate significance for military than for civil aviation. The transfer occurred quite recently and results must be watched and judged in the true and correct experimental spirit.

When it came to the point of legalising this change, a short Bill was passed through Parliament authorising the transfer to any selected department, by mere proclamation, of any work or class of work specified. To the intense disappointment of many of us, the original intention to limit the possibility of such transfers to work associated with defence only was abandoned, and efforts to restore the limitation failed in both Houses.

The position at the moment therefore is that the road is legally clear to put any or all of CSIR's work under a normal department administered in accordance with the Public Service Act.

This danger is tempered by Ministerial declarations in second reading debates that there is no immediate intention to transfer any other divisions than that of aeronautics. May it long remain so. But will it? Personally I am anxious about the future.

Departmentalisation

Tribute has already been paid to the sympathetic way in which the representations of the CSIR and its friends were considered by the Government, and it was with some satisfaction, that when, recently, the whole of the original legislation of 1926 was repealed and a new Act passed by Parliament to replace it, we found that we had at least escaped direct departmentalisation under Public Service Board control.

[The speaker briefly summarised the changes wrought by the new control. First, he said, all the powers and functions vested in the council have been taken from it and placed in the hands of an executive of five, three with scientific training and giving full-time service, on seven-year tenures; two part-time and not necessarily with any experience in science. One of them will be a Treasury official.

A council with similar personnel to the present council would be set up, but purely as an advisory body; the executive would be obliged to take action in relation to any matter referred to it by the Minister; and the appointment of officers and others would be subject to conditions similar to those operating under Public Service Board administration.]

Freedom of Science

I would like (he added) to try and summarise in a sentence or two a situation which may correctly enough be described as difficult. It is not just a local Australian situation. I suspect South African science is already concerned; New Zealand certainly is; maybe Canada, and from what I have already heard, even the calm United Kingdom may feel some measure of interest in it. How very interested we in Australia were in the guarded words of Sir Robert Robinson in his anniversary address to the Royal Society last November. You may recall his plea for alertness in preserving intact the prized freedom of science, and his warning that while no direct attack was likely here, " it could conceivably take the more subtle form of control of the character and direction of our scientific work."

I do not profess to know the way out of the maze. Even the best practicable solution may have to be a compromise containing much that is as inadvisable as it may be unavoidable. Am I wrong in feeling that here is a situation best handled in concert by men of broad outlook, capable of seeing every side of the problem as it exists to-day?

I think that from the scientific side we owe it to the political folk to do our very best to help them solve a puzzle for the propounding of which we must accept some responsibility. Unless we can prove to them that their responsibilities can be discharged by methods which will not in our view and on the basis of our experience, handicap the progress of science and its application, we shall have only ourselves to blame.

NEW SCOPE FOR LAPORTE

Acquisition of Hunt Brothers (Castleford)

A NOTICE from the chairman of Laporte Chemicals, Ltd., Mr. L. P. O'Brien, discloses the company's intention to acquire the entire issued share capital of Hunt Brothers (Castleford), Ltd., which carries on business at the Aire & Calder Chemical Works, Castleford, Yorkshire. The purchase price is £261,000, payable by £23,500 in cash and the balance by the issue of 250,000 ordinary fully paid shares of 5s. in Laporte Chemicals, Ltd.

Hunt Brothers (Castleford), Ltd., whose principal products are sulphuric acid, hydrochloric acid, and sodium sulphate, has a private railway siding, and also water connection with the Aire & Calder Navigation's waterways. The site affords land available for development.

It is proposed that the authorised capital of Laporte shall be increased from £1 million to £2 million. The directors state that they have in mind the possibility of a bonus issue, using part of the share premium account for this purpose.

An extraordinary general meeting of Laporte Chemicals, Ltd., for the purpose of giving effect to the necessary resolutions, is to be held at the Chamber of Commerce room, Luton, on August 5.

Methoxychlor

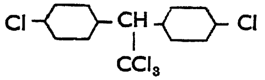
Characteristics of a Potent DDT Analogue

by R. W. MONCRIEFF

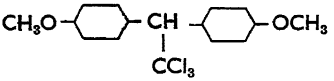
"METHOXYCHLOR" is the name given to the methoxy analogue of DDT, a compound which has a much better knockdown effect than DDT itself and a toxicity of the same order. Its development has now reached the pilot plant scale and it seems likely that Methoxychlor may in part supersede DDT, or, more probably, that it may be mixed with DDT, just as in the past pyrethrins have been added to it (DDT) to improve its knockdown.

The name "Methoxychlor" was filed[1] in the Trade Mark Division of the Patent Office, Washington, for recording as a common name for the chemical 2,2-bis-((*p*-methoxyphenyl) 1,1,1-trichlorethane. The structures of the two compounds are these:—

DDT

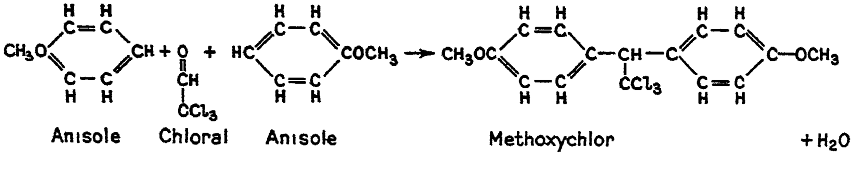


Methoxychlor



The name was not accepted without very careful consideration; those consulted included: the Council on Pharmacy and Chemistry of the American Medical Association, the Committee on Insecticide Terminology of the American Association of Economic Entomologists, representatives of the Public Health Service, Food and Drug Administration, Bureau of Entomology and Plant Quarantine, and the Committee on Nomenclature of the American Chemical Society.

DDT was first made about 70 years before its insecticidal properties were appreciated; Methoxychlor also waited over 50 years for recognition of its utility. The reaction by which it was first made may be expressed:—



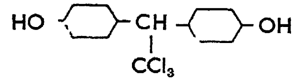
It was first prepared by Elbs[2] from chloral hydrate and anisole, which were condensed in the presence of sulphuric acid, the operation being carried out in solution in glacial acetic acid.

It was later made by Harris and Frankforter,[3] using aluminium chloride, instead of sulphuric acid as the condensing agent, at a temperature of 0° C. in the presence of a tenfold volume of carbon disulphide. They isolated dianisyltrichloroethane (Methoxychlor) as a solid, melting at 94°C., and obtained it in 94 per cent yield. They prepared a large number of similar compounds including DDT itself, its ethoxy analogue, and various similar compounds such as dianisyltribromoethane, dianisylbromoethane and dianisyldibromoethane. They also showed how such compounds could be converted into the ethylenic derivatives by loss of hydrogen chloride to alcoholic potash.

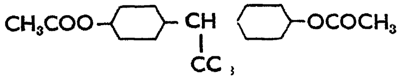
They may now appear to have been rather unlucky not to have observed the insecticidal properties of these compounds during what must have been an extended research carried out at Minneapolis.

P. Läuger, H. Martin and P. Müller[4] of the Geigy Co. reported that the compound (Methoxychlor) possessed some insecticidal effectiveness ("wirksam") but did not describe with what species of insects it had been tested, nor did they give particulars of the concentrations required for toxicity.

Martin and Wain[5] reported also that the compound had some insecticidal activity, but again without specifying the nature of the test insects nor the toxic concentrations. They did, however, state that it was more toxic than the hydroxy analogue, dihydroxydiphenyltrichlorethane,

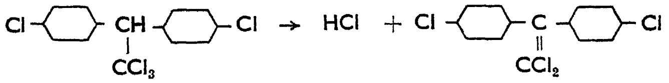


or than the acetyl derivative,



and this more marked activity they attributed to the less polar characteristics and the consequently higher lipoid solubility.

Martin and Wain (*loc. cit.*) expressed the view that its toxicity, like that of DDT itself, was due to the dehydrochlorination that the substance (now known as Methoxychlor) would undergo. That the toxicity of DDT and of related compounds was in fact due to the loss of hydrogen chloride (which was fatal to the insect) seemed to Martin and Wain to be evident from the fact that dichlordiphenyl dichlorethylene, which resulted when hydrogen chloride was split off from DDT (below) was non-toxic to insects:

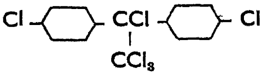


They followed up the matter and extended their view to benzene hexachloride, to chlorinated indanes and terpenes and were in some cases able to predict the insecticidal activity of some compounds. The toxicity of Methoxychlor in the view of Martin and Wain was due to

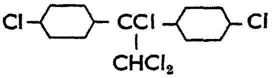
(a) its ability to lose hydrogen chloride *in vivo*

(b) its lipoid solubility.

In support of these views it may be noted that Läuger *et al*[4] found that the compound,

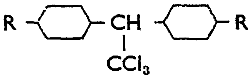


similar to DDT except for the extra substituted chlorine, is inactive; it could not lose hydrogen chloride. On the other hand the compound,



is a good insecticide (mässig wirksam) and this compound could lose hydrogen chloride. Note too that it does not possess the $-CCl_3$ group.

Siegler and Gertler[6] have also reported that Methoxychlor has some considerable insecticidal activity. They prepared several compounds of the general formula,



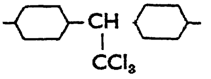
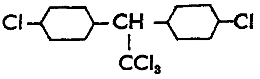
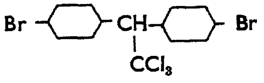
where the substituted group R was $-Cl$ (DDT), OCH_3 (Methoxychlor), $-Br$ CH_3, $-OCOCH_3$. All these compounds were made by the conventional method of condensing 1 mole of chloral hydrate and 2 moles of the required aryl compound (anisole in the case of Methoxychlor) in the presence of concentrated sulphuric acid.

Each compound was prepared for its application as a spray by first dissolving it in 95 per cent alcohol and then precipitating it with water, which was added to make a carrier containing 20 per cent of alcohol by volume. All compounds were used at the rate of 4 lb. to 100 gal. of the carrier.

The toxicity tests were made with the codling moth *Carpocapsa pomonella* larvae, using the apple plug method, one ready-to-match codling moth egg being used to test each of the new compounds, and 68 were used with DDT itself.

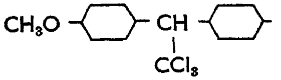
In the absence of any insecticide, 95 per cent of the apple plugs became wormy; when DDT was used, none became wormy and when Methoxychlor was used 3 per cent became wormy. It is evident that although, against the codling moth larva, Methoxychlor is not quite so effective as DDT, it is nevertheless very nearly so.

Results including those obtained with the other analogous compounds that were tested are as follows:—

Substituent Group R	Formula	Percentage apple plugs that become wormy
Nil		47
Cl (DDT)		0
Br		23

(*formula continued overleaf*)

OCH_3(Methoxychlor)



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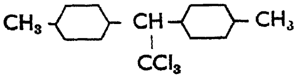
CH_3



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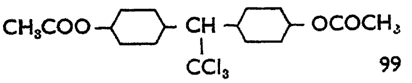
$OCOCH_3$



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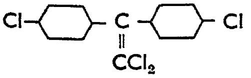
It is evident that the substitution of bromine in the aryl nuclei instead of chlorine (DDT) considerably reduces the efficacy of the insecticide. The methyl group, perhaps surprisingly, gives a quite toxic compound, although it has a distinctly lower toxicity than has Methoxychlor.

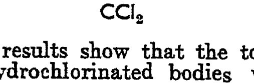
The presence of the acetoxy groups in the rings completely destroyed the toxicity; indeed the plugs treated with 2,2-bis (*p*-acetoxyphenol)-1,1,1-trichlorethane had a higher percentage wormy than those that were untreated. If the aryl nuclei were unsubstituted then the compound had only a low toxicity.

In view of Martin and Wain's theory that the toxicity of DDT and related compounds is due to their ability to split off hydrogen chloride, it is of interest to note that Siegler and Gertler tried the effect of dehydrochlorinating some of their compounds. The results they obtained were as follows:—

Substance	Percentage of apple plugs Wormy
2, 2-bis (*p*-chlorophenyl)-1.1,-dichloroethylene	85



2, 2-bis (*p*-bromphoenyl)-1, 1-dichloroethylene	86



These results show that the toxicity of the dehydrochlorinated bodies was very low and they support the views of Martin and Wain.

The main conclusion that can be drawn from the work of Siegler and Gertler is that when the substituents in the *para* position of the aryl groups are those that will lend lipoid solubility to the compound then the compound is toxic. There appears to be no specificity of the chlorine atom as a substituent in the aryl groups. Very likely, however, there is specificity of the chlorine atom in the $-CCl_3$ group, although further work appears to be necessary to clarify this point.

It is clear, too, that of the substituent groups tried in the aryl nuclei, chlorine (DDT) and methoxy (Methoxychlor) appear to be the most powerful. The main defect of DDT, with its chlorine substitution, is its low power of knockdown, and against flying insects this is a considerable disadvantage. In attacking flying insects, Methoxychlor may well appear to hold an advantage over DDT, although against larvae DDT appears to have a rather higher toxicity.

Against Housefly

Prill, Hartell and Arthur[7] compared the insecticidal activity of some alkoxy analogues of DDT, using the housefly *Musca domestica* L as a test insect. They found that Methoxychlor (m.p. 89° C.) showed a surprisingly good knockdown, better in fact than did DDT itself.

Used in a concentration of 0.15 grams per 100 c.c. of Deo-Base, a refined petroleum distillate, it was not quite up to the required standard, but with 0.2 grams per 100 cc. it was very satisfactory. These lower concentrations gave poor kills (slightly lower than 0.25 grams DDT per 100 cc.) but 0.4 grams Methoxychlor per 100 cc. gave a good kill.

Tests were made by the large Peet-Grady method[8]; in each case the resistance of the culture was determined for each culture of flies by the official test insecticide (OTI), the purpose of this being to show up any significant differences in the resistance of one lot of flies from another. Results were as follows

	Concn. gm. per 100 cc.	Knockdown in 10 mins. per cent	Knocked down flies dead in 24 hrs per cent of original number	OTI Kill in 24 hrs. per cent
DDT	0.25	42	38	49
Methoxychlor	0.15	91	31	51
,,	0.20	99	32	34
..	0 40	99	85	46

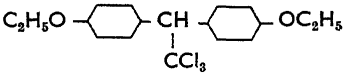
Slow knockdown is a recognised defect[9] of DDT and Methoxychlor shows to very considerable advantage in this respect. On the other hand, most of the flies knocked down by DDT subsequently died, whereas in the case of Methoxychlor a large percentage recovered, except when a higher concentration was used. When that was done and 0.4 grams per 100 cc. was used knockdown was excellent and the kill was very good.

These results suggested to Prill *et al* that the use of a mixture of DDT and Methoxychlor might possibly combine the advantages of both insecticides. When this was tried, results were as follows:

	Concn. gm. per 100 cc.	Knock-down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
DDT + Methoxychlor	0.10 0.15	94	86	44

The knockdown and the kill with the mixture of 0.10 gm. DDT and 0.15 gm. Methoxychlor per 100 cc. are both very much better than with 0.25 gm. DDT per 100 cc.

The ethoxy analogue diphenethyl trichloroethane,



and the *n*-propoxy and *n*-butoxy analogues were also tried. They gave results as follows:

	Concn. gm. per 100 cc.	Knock-down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
Ethoxy	0.20	90	86	34
Propoxy	Much inferior			
Butoxy	Much inferior			

The ethoxy analogue (m.p. 105° C.) at a concentration of 0.2 gm. per 100 cc. gave a good kill and a knockdown much better than that given by DDT, but not quite so good as that given by Methoxychlor. In respect of kill it was rather better than Methoxychlor. A mixture of the two alkoxy derivatives gave a good knockdown and a good kill.

	Concn. gm. per 100 c.c.	Knock-down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
Methoxychlor Ethoxy analogue	0.15 0.15	97	88	44

It seems that the methoxy analogue, Methoxychlor, may have the best all-round properties, although it is closely approached in this respect by the ethoxy analogue. There is no doubt whatever that the knockdown effect of Methoxychlor is very markedly superior to that of DDT. Mixtures of DDT and Methoxychlor may have properties that excel those of either component separately. It is even possible that a ternary mixture of DDT, Methoxychlor and the ethoxy analogue would be still better; on general biochemical grounds it would not be surprising if it were so.

These three insecticides were also tested against mosquito larvae (*Culex quinquefasciatus* Say) and concentration of 0.03 to 0.04 parts per million in tap water killed half the larvae in 20 hours. They were about equally effective.

Feeding tests on rats suggested that the ethoxy analogue may be less toxic than DDT to higher animals; by analogy it might be expected that Methoxychlor would also be less toxic than DDT, but that yet remains to be proved. The toxicity of DDT to higher animals was reported by Draize *et al.*[10]

These trials of Prill *et al* demonstrated clearly that Methoxychlor is an insecticide of the same order of effectiveness as DDT, that it has a much more rapid knockdown action, and that there is much to be said for its admixture with DDT.

The question of its use unmixed will doubtless have to await the results of more extended trials. The fact that its manufacture on a pilot plant scale has already been reported from America suggests that its potentialities are being considered very seriously. It is worth noting, however, that in another trial 0.10 gm. DDT and 0.05 gm. pyrethrins per 100 cc. gave results as good as 0.10 gm. DDT and 0.15 gm. Methoxychlor.

Manufacture

The production of Methoxychlor has been investigated by Schneller and Smith.[11] After an experimental investigation of the effect of several variables on the yield and quality of the product, they devised a pilot plant procedure. On its initial run, using the following quantities of materials:

	lb.
Chloral (including 2 per cent excess) "DDT grade"	877
Anisole, redistilled	974
Sulphuric acid, 66° Bé	875
Carbon tetrachloride	1100
Sodium carbonate	120

a yield of 88.1 per cent of Methoxychlor was obtained; *i.e.*, the yield was nearly 1400 lb.

The anisole and the chloral are mixed and the acid added slowly, to effect the condensation, with vigorous agitation. The reactor, which is of 300-gal. working capacity and is enamel-lined and jacketed and fitted with an anchor-type stirrer and equipped for distillation, is maintained by external cooling at 25 to 30° C.

With good mixing the reaction time is less than 1 hour. As the reaction approaches completion, the mass thickens owing to incipient crystallisation, and the carbon tetrachloride is added in sufficient quantities to keep the mixture fluid enough to be stirred. Stirring is continued for 1 hour after the first addition of the carbon tetrachloride.

The reaction mixture is blown out of the reactor vessel into a tank containing 700 gal. of cold water and stirred. The supernatant aqueous acid layer is separated and rejected. The slurry is washed by stirring with hot water, allowed to separate and the aqueous layer decanted. The washing is repeated with the addition of sufficient sodium carbonate to neutralise the mixture.

The washed slurry is run back into the reactor and the carbon tetrachloride distilled from the slurry in the reactor vessel with steam. The Methoxychlor is run out of the still into containers in which it solidifies (setting point 69° C.). The solidified product is ready for use as "technical grade."

When purified, the product melts at about 88° C. It exhibits dimorphism, and a product melting about 78° C. has also been prepared; this readily changes into the higher melting form, but the reverse process cannot at present be brought about.

Conclusions

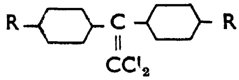
Methoxychlor has been shown to have a toxicity as an insecticide of the same order as that of DDT. Against the codling moth it is nearly as good, and in a test prevented the development of the larvae of this insect in 97 cases out of each 100 tested. Lead arsenate, the traditional remedy for this pest, was successful to the extent of only 60 per cent.

Against the housefly, Methoxychlor is very much superior to DDT in its knockdown effect. When used in concentrations of 0.2 per cent (wt./vol.) in a petroleum-derivative solvent it gives a very high knockdown of flies but appears not to kill them all. DDT has a much lower knockdown but a high percentage of those knocked down are in fact killed. If a 0.4 per cent (wt./vol.) solution of Methoxychlor is used, not only its knockdown, but also its "kill" is excellent.

Mixtures of DDT (40 per cent) and Methoxychlor (60 per cent) appear to be much more effective against flies than DDT alone, and probably better than Methoxychlor alone.

Its preparation presents no difficulty; it can be made by the condensation of anisole with chloral hydrate in the presence of sulphuric acid, a method exactly analogous to that used for manufacturing DDT from chlorobenzene and chloral hydrate. The manufacture of Methoxychlor on a pilot plant scale has given yields approaching 90 per cent, a figure that would doubtless soon be passed if large-scale production was undertaken.

The insecticidal properties of other analogues of DDT, in which other groups replace the chlorine in the aryl nuclei, have been investigated. It appears that provided the substituent group is not highly polar, lipoid solubility will be exhibited by the compound and it will show insecticidal properties. If, however, the substituent group is strongly polar ($-OH$ or $-OCO\ CH_3$) lipoid solubility is low and no marked insecticidal properties are evident. It has been suggested that for toxicity to appear in this range of compounds to which the two insecticides belong there must be (1) lipoid solubility (2) the ability to split off hydrogen chloride. While it has been clearly demonstrated that compounds such as DDT and Methoxychlor which are themselves highly toxic, give rise on the loss of hydrogen chloride to substituted dichlorethylenes of the type.



which are non-toxic or only slightly toxic, it cannot yet be said that this view is completely proved. For example, some workers have thought that the toxicity of DDT and its analogues is due to the anaesthetic action (nerve paralysis) of the $-CCl_3$ group. The high activity of Methoxychlor makes it clear that the *p*-chlorphenyl groups of DDT have no specificity—probably their function is simply that of conferring lipoid solubility on the product. A further advantage that Methoxychlor may have over DDT is that it seems likely to be less toxic to mammals.

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[2] K. Elbs, *J. prakt. Chem.*, 47 (2), 68 (1893).
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CENTRIFUGAL MOULDING OF PLASTICS

Formation of Asymmetrical Shapes in Plexiglas

A MASSIVE aerial centrifugal machine, named the Rotoformer, for shaping plastic canopies of the largest sizes for U.S. aircraft of all types, has been designed by scientists of the Goodyear Aircraft Corporation, Akron, Ohio, where it is now in use.

Shaping of aircraft canopies is accomplished by spinning the plastic material at high speed. Sheets of Plexiglas, the American equivalent of Perspex, heated to a soft, pliant state, are made to assume their final form by centrifugal force. This is believed to be the only known way in which optically clear plastic canopies can be made in shapes that do not conform in cross section to the arc of a perfect circle. The new process makes possible fabrications with cross sectional contours that are geometrically close to parabolic shapes, which permit them to be fitted into aircraft with maximum streamlining.

The new machine has a tubular steel rotating shaft, 8 in. in diameter and approximately 20 ft. long, from which is suspended a fixture in which the canopy is formed. The fixture is a retaining frame made to the exact dimensions of the aperture of the aircraft fuselage, and a protective covering to protect the plastic during the spinning process.

The plastic is held only by the part of the plastic sheet that ultimately becomes the mounting base of the canopy. This is secured with metal clamps. The rest of the sheet is free.

A protective cover is then placed over the assembly and the big drive shaft is electrically revolved to cause the plastic sheet to turn at high speed. The spinning is controlled until the plastic has been extended to the desired limits by centrifugal force and is continued until it has cooled and set. The final contour, over the top centreline, must conform to a plus or minus tolerance of within a fraction of an inch.

The girl standing inside the full-size plastic aircraft canopy holds a similar fitment for a small 'plane Behind her is the Rotoformer centrifugal moulding machine

COLOURED ASPHALT IS UNDERGOING ROAD TESTS

EXPERIMENTS carried out by the Road Research Laboratory, Department of Scientific and Industrial Research, have produced asphalt in colours such as cream, yellow, red, green and blue at a cost not very much greater than that of ordinary asphalt.

The DSIR report states that coloured asphalts made from pigmented " albino " bitumens have been used for many years, but they are much more costly than ordinary asphalt. Only dark shades can be produced because of the intrinsic darkness of the bitumen.

The new bright colours are made by using a proprietary brand of resinous binder known as " Cados." It is more translucent than albino bitumen. Using this binder and a clean white aggregate such as calcined flint it is possible to obtain a fine white asphalt which can be easily coloured with any desired pigment. The addition of 4 per cent of titanium oxide, for instance, gives a creamy white. Effective reds and yellows, greens and blues have been made with as little as 2 per cent of other pigments.

The materials have not yet been tested under traffic, but a small area in four colours at the laboratory is giving promising results. Trial areas on roads and footpaths are being planned and the results of large-scale trials on public roads should be available in a few months.

Widening Range of Rubber Uses

Holland Simplifies the Transparent Film Process

NEW uses for rubber in spheres usually covered by plastics have recently come to light. In this connection, a new industry is being established in Holland, based on natural rubber and hydrochloric acid. The Rubber-Stichting, Delft (Rubber Foundation), which is associated through the International Rubber Development Committee with similar organisations in Great Britain and France, has developed the new material and has applied for patents in all the important countries of the world. The Stork concern at Hengelo in Holland is one of the first licensees.

Prior to the war rubber hydrochloride (Pliofilm) was manufactured in America, and is now being made in England and is applied, among other things, for packing purposes, especially in instances where water-clear transparency and a very low moisture permeability are required. (THE CHEMICAL AGE, *60*, 271, 370, 618.)

Contrasting with the American method, the new process and equipment are extremely simple, so that an industry having hydrochloric acid available can manufacture at low capital cost.

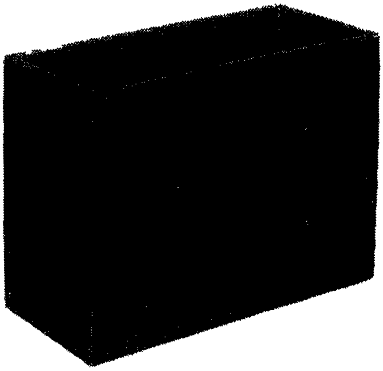
During recent years natural rubber has felt competition not only from synthetic rubbers but also from plastics. By the effect of the new process—the result of a very long and intensive laboratory research—natural rubber growers can hope to recover part of their market in this competitive field.

A more detailed description of the new process is being issued shortly by the British Rubber Development Board.

Ebonite Vessels

Another example of the use of rubber in unaccustomed rôles is in the solution of the difficult problem of storage of corrosive chemicals (solid and liquid), now being used increasingly in many industries.

There are not many materials which can be used with safety to contain such chemicals. The announcement by Lorival Plastics of the manufacture of ebonite tanks for this purpose is therefore interesting. These containers, manufactured from chemically resistant hard rubber, are at present made in two sizes. The smaller is 14 in. high, 11 in. wide and 19 in. long, with a wall thickness of 5/16 in. and weighs 19 lb.; it has a capacity of 10 gal. The larger, with a capacity of 20 gal., is 20 in. high, 11 in. wide and 27 in. long, with a wall thickness of ½ in.; it weighs 42 lb.



[By Courtesy of Lorival Plastics, Ltd.

The new chemically resistant ebonite tank, holding 20 gal.

Many hundreds of containers made from similar material were used during the war by the armed forces as chlorination tanks for purifying water supply. Their usefulness in chemical plant is visualised also in the manufacture of photographic materials, in laundries, to hold agricultural insecticide materials, for dyeing and cleaning liquids, in tanneries and paper factories, in plating works and research laboratories. The tanks, with strong walls, are sufficiently stable to need no special stand and are relatively inexpensive.

Institute of Welding

THE annual report of the council of the Institute of Welding for the year ended March 31, presented at its recent annual general meeting in London, revealed an increase in membership, 4818 against 4631 in the previous year.

The growth of branches, both in activity and in number, continued throughout the year. Council recognition was accorded to a new section at Hull, under the Leeds branch, and to the first overseas branch, in India. Inquiries have been received with a view to the formation of a section of the South London branch to serve the Medway area.

CHEMICAL PROSPECTS IN CHINA

Foreign Capital and Technicians will be Needed

CURRENT conditions in China are thought likely to result eventually in enlarged demand for imported chemicals and for foreign capital and technical men particularly to assist in re-establishing and developing the basic chemical industries. An era of peace is, of course, the greatest immediate need. The people are mostly peaceful and industrious, and the land has vast natural resources that could form the basis of a large and flourishing chemical industry.

A recent report by the U.S. Department of Commerce, relating mainly to territory which was then under control of the Nankin government indicates that despite the acute difficulties engendered by Japanese and Communist aggression, chemical industry had to some extent held its ground and even developed with the assistance of UNRRA. Japanese occupation, moreover, was not wholly destructive.

Advances in the North

In Manchuria, especially, since it came under Japanese control, some progress has been made in various directions including chemical manufacture. The Japanese, in fact, extended some factories and established new ones. In December, 1941, this extension programme was accelerated, and, during 1943-4, chemical industry in northern China reached a relatively high level.

In 1947 the Commission on National Resources (CNR), which was appointed in 1935, concentrated its attention on key industries, and in 1948 it directly controlled 13 factories and exercised some sort of advisory supervision over others.

Lack of Coal and Power

One of the chief centres of chemical industry in China is Shanghai, where, of some 200 factories engaged before the war about 77 were working in 1947 and covered 60-80 per cent of the total demand for chemical goods. In the city and surrounding district there was also, in 1947, considerable production of chemical raw materials and pharmaceuticals, but owing to lack of coal, electric power, and transport difficulties, production has perforce largely to be diminished.

The same applies to other large industrial centres: Tientsin, Hankow, Tsingtao, Canton.

The organic chemical industry is little developed but has large possibilities. Alcohol is manufactured in considerable quantities—about 10 million gal. per annum. Of the dyes, aniline black is about the only one produced from coal tar; the necessary basic industry, coke and gas, is largely lacking. What organic chemical industry there is has been centred mainly in the Shanghai district.

The average monthly production in 1946 of the soap industry of Shanghai was 140,000 cases, 180,000 in 1947, and estimated at 200,000 in 1948. Capacity could easily be raised to 500,000. There is serious lack of caustic soda. Tung oil is one of China's leading natural resources. The abrasin, or tung tree, is widely distributed, among the principal centres being the provinces of Czechuan, Hunan, Houpa, and Kowchow. Attempts are being made to restore the industry to an annual output of at least 180,000 tons, of which two-thirds would be for export.

German Technical Reports

THE Board of Trade announces that the following reports on German industries, although considered unsuitable for publication, may be inspected at the TIDU offices, 40 Cadogan Square, S.W.1.:—

FD 3276/48. Some remarks on design and manufacture of optical instruments in Western Germany.

FD 1011/49. Insecticides and fungicides at the I.G. Farbenindustrie plant, Höchst.

FD 1013/49. Manufacture of torula food yeast from sulphite liquors.

FD 1030/49. Staple fibre (spinning) at Thüringsche Zellwolle, A.G. Schwarza.

Next Week's Events

MONDAY, JULY 25

Royal Institute of Chemistry

St. Andrews: University (until July 30) symposium: "Recent Advances in the Fermentation Industries."

TUESDAY, JULY 26

Parliamentary and Scientific Committee

London: House of Commons, Committee Room 12, 5 p.m. To consider interim report of the sub committee on development of backward areas under President Truman's "Fourth Point." Dr. W. K. Slater, secretary of the Agricultural Research Council: "The Work and Plans of the Agricultural Research Council."

PARLIAMENTARY TOPICS

Ending Fertiliser Subsidies

THE intention to withdraw the Government subsidy on agricultural fertilisers was disclosed in the House of Commons this week by the Minister of Agriculture (Mr. Tom Williams). He said, in reply to Mr. G. Jeger, that the present price system had ruled since October, 1940, and no change was proposed during the year July 1, 1949, to June 30, 1950. However, it was intended thereafter that the subsidy on agricultural fertilisers should be withdrawn in two approximately equal stages, during the fertiliser years 1950-51 and 1951-52. The increase in cost would be taken into account in the annual price review of agricultural products.

REPLYING to a question by Sir F. Sanderson, in the House of Commons last week, Mr. J. Freeman said the Ministry of Supply's stocks of virgin copper, including stocks abroad and afloat, amounted to approximately 170,000 tons on June 30. It was estimated that a further 150,000 tons would be delivered under our present commitments which extend to the end of 1949, but which were not all covered by contracts with definite terminal dates. Owing to the large number of separate transactions and to other factors, such as charges for refining blister and rough copper and scrap, an average price would have no significance, but the greater part of the copper already delivered was bought at a price related to the New York export price of £130 12s. 5d. a ton. Some of the copper yet to be delivered was bought at a price related to this price and some at prices related to the lower prices prevailing since March 29. Prices for the remainder had yet to be fixed. The present New York export price was £97 19s. 4d. a ton f.a.s.

A QUESTION by Mr. A. R. Blackburn, to the Lord President of the Council, drew from Mr. H. Morrison the reply that research aimed at finding effective new substances akin to compound E in the treatment of rheumatic diseases was in active progress under the Medical Research Council. He was advised that these compounds were difficult to make and early success was not to be expected.

MR. J. FREEMAN said the "very heavy losses" alleged by Mr. Winston Churchill and others to have been made to date on stocks of copper, lead and zinc "amounted to a profit of about £6 million."

SCIENCE IN INDUSTRY

Practical Demonstrations for R.I.C.

AMONG the many facilities offered to its members by the Royal Institute of Chemistry is the opportunity to see for themselves the practical application of science in various industrial activities by the organisation of tours and visits to factories, laboratories and works.

Two visits recently organised by the London and South Eastern Counties section were well attended and again proved of great practical value.

During the visit to the British Oxygen Co., Ltd.'s works at Cricklewood, the party watched demonstrations of welding, oxyacetylene cutting and saw a colour film showing applications of oxyacetylene flames.

The elimination of oxygen from the point where a joint is being welded may be effected by means of the volatile products from a combustible coating on the rod of the welding metal, or by a refractory powder, or by a stream of argon and craftsmen demonstrated the welding of steel, copper and aluminium and the brazing of brass by one or more of such techniques employing electric arcs of flames of carefully chosen characteristics.

In contrast it was interesting to see an oxyacetylene flame cut through thick slabs of mild steel and cast iron with an ease almost comparable to that of cutting hard butter with a warm knife, and the perforation of a foot-thick block of steel with the "oxygen lance" in less than a minute.

A tour of the factory of Pharmaceutical Specialities, Ltd. (May and Baker, Ltd.), Dagenham, was greatly appreciated by the visitors.

The divisions open for inspection were the pharmaceutical laboratory, where the preliminary formulating and small scale preparations are carried out; the chemotherapeutic research laboratory, where new substances are synthesised and tested; the technical development laboratories, which take over promising substances from the research laboratories and deal with the pilot or semi-scale stage; various processes in the works including the preparation of iodides, hydrobromic acid, mercurials, aromatics and the ether plant; the pharmaceutical preparation and packing division where the preparation of tablets and the filling and sealing of ampoules were demonstrated; finally the analytical control laboratories.

Technical Publications

PRECISION electrical apparatus is being increasingly used in a variety of chemical and physical applications. A wide variety of testing equipment—signal generators, impedance bridges, high and low range ohmmeters, and many other instruments—are listed in the latest catalogue and price list now available from Taylor Electrical Instruments, Ltd., Slough.

* * *

THE properties of titanium dioxide as ceramic material for electro-technical purposes, and methods for reducing the high negative temperature coefficient of pure TiO_2 to zero by means of suitable admixtures are the subject of an article by E. J. W. Verwey and R. D. Bügol in the current issue of Philips Technical Review (Vol. 10, No. 8; Philips Electrical, Ltd.).

* * *

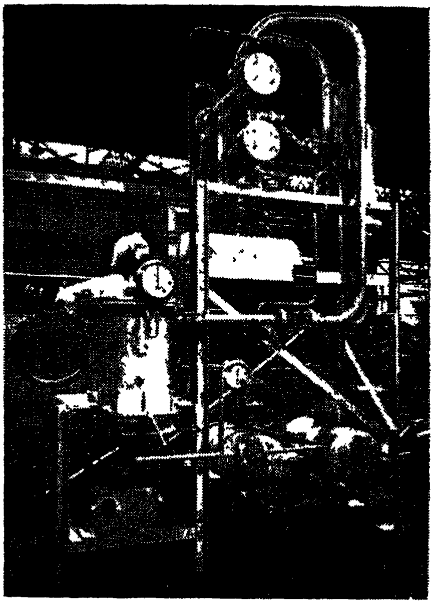
THE importance of research in the petroleum industry is outlined in an article in the first issue of the new Esso magazine for June, which states that the Standard Oil Co. (N.J.) invests $20 million annually to maintain the development of new products. The magazine contains a wide variety of articles and is excellently produced and illustrated.

* * *

AMONG the many interesting features in the current issue of *Endeavour* (July, 8, 31), is an article on high-polymer molecules in solution, by A. R. Miller, who returned to Cambridge after the war as an I.C.I. Fellow and is now working at the Royal Society Mond laboratory on problems of low-temperature physics. Other articles deal with nitrogen metabolism in plants; science in the detection of crime; flight at supersonic speed, scientific education in U.S.A. The colour reproductions of the garden at Tresco, Scilly Islands, and specimens of decay of timber are of the usual high quality associated with this publication.

* * *

THE uses of the photoelectric spectrophotometer as a powerful new instrument for analysis and research lend interest to the first issue of the "Bulletin of the Photoelectric Spectrometry Group." The inaugural meeting of the group, which now has 130 members, is reported, as are the papers read, and there is an article describing a preliminary collaborative test on aqueous potassium nitrate.



A complete Merz system pilot plant for solvent extraction recently fabricated by the London Aluminium Co., Ltd., Birmingham, and shipped to India on behalf of the Department of Chemical Technology, Bombay

METHODS of increasing the efficiency of milling operations at one of the largest U.S. ore treatment plants at Cardin, Okla., are described in Report 4511 of the Bureau of Mines. Results of the study show that the recovery of zinc minerals could be substantially increased by improving some operating conditions and that, by applying the sink-float treatment to certain types of jig feed, the loss of zinc in industrial wastes could be reduced by approximately 50 per cent. The investigation also indicated that the crushing and wet grinding of ferrosilicon are commercially feasible.

* * *

UNDER the title "Smoke Inspectors' Case-Book" some characteristic examples are given of cases investigated by the National Smoke Abatement Society and recorded in the summer issue of "Smokeless Air," the journal of the society. There are also a number of excellent photographs.

The Chemist's Bookshelf

The Basis of Chemotherapy. T. S. and E. Work. 1949. London: Oliver & Boyd. Pp. 435. 26s.

Reference to any of the journals devoted to organic chemistry, either in this country or abroad, will inevitably show that a large proportion of present-day work is devoted to experiments designed to produce new drugs for malaria and other diseases. In this connection we are reminded of the work of Ehrlich, who may be designated as the father of modern chemotherapy, his first experiments in this branch of science having been carried out in 1891. This science is concerned with elucidating the reasons why certain drugs behave as they do against various organisms. It is not until we know the way in which drugs act that we can develop a logical programme of research in an attempt to make more effective drugs. The theoretical developments in the present volume provide no easy method to the production of new chemotherapeutic drugs, but are an endeavour to provide a logical cause for the whole subject.

Although the therapeutic use of any chemical might be regarded as chemotherapy, it is usual, in practice, to restrict the meaning of the term to the chemical treatment of diseases of microbial origin with a view to eliminating the microbial infection. It is in this sense that the term is employed in this book. After an historical introduction, the book is divided into six chapters dealing with those aspects of drugs and their action which, when integrated, throw some light on the science of chemotherapy as a whole. The first of these chapters is concerned with cell metabolism, including carbohydrate and protein synthesis, and is followed by one on essential metabolites. The antagonism of sulphonamides for para-aminobenzoic acid and related topics are fully discussed. Drug resistance is playing an increasingly large part in the practical difficulties associated with the clinical control of infection, it having been found that sulphonamides give rise to resistant strains of bacteria as do penicillin and streptomycin. The concluding chapter deals with the relation of structure of drug molecules to their activity, and in order to obtain a clearer picture of these variations, the effect of altering the structure is considered under three heads: the change in distribution, the alteration in *in-vitro* action of the drugs, and factors affecting the interaction of drugs with enzymes.

Chemotherapy being a hybrid science, its workers are drawn from many of the pure sciences, such as chemistry and biology. Until now there has been no one book to which they could go for general information on this new science which would serve as an introduction to the subject. The authors in their preface say: "If this book does something to focus attention upon the modes of action of drugs rather than upon the synthesis of ever more variants on their chemical structure, it will, to some extent, have fulfilled its purpose." Because this book covers a wide and over-lapping field, some of the material may seem elementary to a specialist in any given section. The text is clearly written and freely illustrated with diagrams and tables.

A Textbook of Theoretical and Inorganic Chemistry. Philbrick and Holmyard, revised in collaboration with W. G. Palmer. 1949. London: J. M. Dent & Sons, Ltd. Pp. 854. 13s. 6d.

It is a pleasure to welcome a revised edition of this well-known book, which made its first appearance in 1932. The text is designed for university entrance scholarship and degree examinations and is divided into three parts. The first is an historical introduction, which is followed by a study of general and theoretical chemistry, and the third part is a systematic account of the elements and their compounds. It is in the second part that the most substantial revisions have been made, and accounts of the trans-uranic elements and of the theory of valency are included. One of the merits of the third part is that the so-called rare metals such as vanadium, titanium and tungsten are treated thoroughly and not relegated to a few lines of small type. The inclusion of a most adequate index will enable this volume to be used as a small reference volume or as a students' textbook.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

THE organisation of this year's 22nd Exposition of Chemical Industries has been planned on a scale rivalling any previous enterprise. It will be held in the Grand Central Palace, New York City, during November 28—December 3. All available space on the Palace's four floors will be required. Exhibits will be composed of raw materials, machinery and products covering every recognised industrial and commercial application of chemical materials, from medicinal preparations and foodstuffs to such things as paper, plastics, dyes, and related chemical products. The 50,000 visitors at the last of these displays, held in 1947, represented nearly 60 different industrial groups. E. R. Weidlein, director of the Mellon Institute, is chairman of the advisory committee, composed of leaders in the major fields of interest which the exhibitors represent.

* * *

Improving upon a process developed by the U.S. Bureau of Entomology and Plant Quarantine, announced several months ago, the synthesis of pyrethrum-like esters has been achieved in the Jersey City laboratories of S. B. Penick & Company, New York, one of the world's largest botanical drug houses. Pyrethrum, naturally obtained from flowers from East Africa, is a basic insecticide and has long been regarded as the least toxic. Preliminary tests on flies indicate the synthetic material to be equal in toxicity to the natural. Further technical work remains to be done, but the new compound is now being made in limited quantities. It is found that in addition to the known active principles, pyrethrin I and II, there were two other principles, cinerin I and II. The new synthetic is referred to as the allyl homologue of cinerin I. It is hoped that eventually the domestic production of synthetic pyrethrum will make the U.S.A. independent of foreign sources of supply.

* * *

Amberlite IRA-400, a new, strongly basic anion exchanger which is said markedly to increase the scope of ion exchange technology, has reached full plant-scale production. It is described as the first resin absorbent which can be used to split neutral salts completely, to convert salts to the corresponding free bases of the metallic ions. One of its important contributions is the direct removal of silica from boiler feed. It will absorb negatively charged ions from acid, neutral, and even mildly alkaline solutions in a *p*H range from 1 to 10. The exchanger behaves as solid caustic with only its hydroxyl ions in solution. Its reaction as a strongly dissociated base largely explains its marked exchange rate, found to be far greater than other anion exchangers. This rapid rate of exchange is regarded as a very desirable feature where "batch" techniques are practicable. Thus it offers new opportunities for ion exchange methods in applications apart from water conditioning. For example, it is said to absorb all amino acids with isoelectric points below *p*H 10, and in ash removal operations it is capable of eliminating the anionic impurities first, a reversal of the usual de-ionisation procedure. The resin can be mixed intimately with strong cation exchanger to prepare a bed that will completely de-ionise solutions in one column and in one step, state the makers the Rohm & Haas Company.

* * *

A new catalogue (No. 3) listing translations of 91 Russian scientific papers is now available from the Research Information Service, 509 Fifth Avenue, New York City, translators of foreign technical data. The fields of science and technology covered by the translations include biophysics, ceramics and glass, chemical warfare, inorganic chemistry, organic chemistry, physical chemistry, crystallography, drugs and insecticides.

* * *

The first edition of the international "Who's Who in Plastics" has just been published by the Society of the Plastics Industry, Inc. In its biographical section are the names of 2989 individuals, their present and past affiliations, position in each case, and educational background. The company section lists company name and address, key officers, company products, and methods of manufacture. The book provides data about companies located in the U.S.A., Canada, the United Kingdom, Europe, South America, India, Australia, and China. It is being distributed by the Society of The Plastics Industry, Inc., 295 Madison Avenue, New York 17, N.Y. ($5.50).

ACID RESISTANT CEMENT

Norway Studying Calcite

CALCITE, a limestone ($CaCO_3$) which appears to confer on concrete unusual water and acid-resistant qualities, may in time become a significant export item of Norway, according to the Norwegian Information Service, New York.

The Norwegian engineer, Arne Daniels, of the Vaagsoy Cement Works in Sunnmore, recently presented results of a series of tests to an assembly of fellow-specialists in Oslo. According to these, four parts of cement to one part of calcite mixed into concrete, form a building material highly resistant to salt water, weather and acids.

Several years ago, while examining concrete installations in the tide-water section near Vaagsoy, Daniels noted that a cement dock, built in 1913, showed no indications of water action. Further investigation proved that the fisherman who built it had unknowingly mixed calcite into the concrete.

During the past two years, a series of laboratory experiments have indicated that calcite may in reality be the key to a highly efficient constructional material. Whether the new ingredient will, for example, make it possible to use calcite-concrete instead of glazed tile pipe in acid soil, or to effect other savings in increased durability of dams, wharves, and exposed structures, will depend upon results of practical tests extending over a period of years.

Aromas and Textiles

THE peculiarly pleasant smoky peat smell, the distinguishing characteristic of genuine Harris and Irish tweeds, has inspired wool interests in both Australia and South Africa to seek some imparted synthetic aroma which may reveal the origin of clothing and blankets made from national wool.

Intensive research has been sponsored in both countries and chemists in Melbourne and Johannesburg are trying to devise an odour which will not wash out, will be lasting, cheap, not disliked by anyone, and, as far as possible, may be characteristic of the country as a whole.

In Johannesburg advanced tests have been made with a veld-fire aroma, the nearest equivalent to the smouldering peat smell. It is reported to withstand washings, and cost of treating a blanket is said to be only one-tenth of a penny.

INDIAN RESEARCH

New Dyes and Fuel Oils

AMONG the chemical research work recently carried out in the laboratories of the Presidency College, Madras, under a scheme of research financed by the Indian Government's Council of Scientific and Industrial Research, a valuable intermediate required for the production of photographic developers of the Amidol, Diamol and Dolmi class, and of dyes employed in the dyeing of furs and hair, (2.4-Diaminophenol) has been obtained in good quantities by the electrolytic reduction of m-dinitrobenzene. This is carried out in sulphuric acid emulsion using a copper or monel cathode and a lead anode in the presence of mercuric and ceric sulphates. In simplicity and economy of operation, and low upkeep charges, the process is believed to be superior to the other known processes.

Investigations carried out under the auspices of the CSIR have shown that most of the Indian vegetable oils can be successfully employed as diesel fuels. Cotton seed oil, in particular, gives exceptional performance in that its consumption is definitely less than that of mineral oils. Despite their good performance, however, vegetable oils cannot compete on a price basis with mineral fuels.

If the vegetable oils could be used as a vehicle for powdered solid fuel, the result would be economically more attractive and the oils might be able to compete with mineral oils. This possibility has, in fact, been tested in the laboratories of the CSIR. The results have shown that, with the use of a stabiliser prepared from the vegetable oil itself, colloidal fuels containing as much as 35 per cent by weight of charcoal can be prepared and stored for long periods without the charcoal settling out.

Provided the injection system is replaced to suit the new fuel, it has been found that a thermal efficiency approaching that of groundnut oil can be attained, the charcoal part being burnt as efficiently as oil itself.

More Bauxite in Dutch Guiana

New deposits of bauxite are reported to have been discovered in the Nassau mountains in the southern region of Surinam, which is already one of the world's leading producers. The quality of the ore in the new find is claimed to be better than that previously exploited there.

◆ HOME ◆

Expansion

Industrial Gases, Ltd., is erecting new works premises at Richmond Road, Trafford Park, Urmston.

Profits Shared

Manual workers of the Nuffield organisation are being given a share of profits based on the 1948 dividend, totalling £116,865. A total of £1,324,388 has been distributed since 1936.

Refined Oils and Fats

The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users, during the eight-week period ending September 10.

Coal Production

Britain's total coal output last week increased by 135,300 tons. Comparative figures are:—Last week: 4,179,900 tons (deep-mined 3,886,100 tons, opencast 293,800 tons); previous week 4,044,600 tons (deep-mined 3,756,200 tons, opencast 288,400 tons).

Steel Research Centre

A site in Burnt Tree Lane Sheffield, has been selected by the British Iron and Steel Research Association for the erection of a new research centre. This is the first station to be designed and built specially for the association since its foundation by the British Iron and Steel Federation in 1945.

Training of Supervisors

The Institute of Industrial Supervisors, of which Sir Percy Mills is the first president, has set up an educational advisory panel of administrators, supervisors and foremen, to improve efficiency and provide information. Mr. Michael Clapham (Metals Division, personnel director, I.C.I., Ltd.) is one of its members.

Successful Dust Suppression

It has been reported to the North Wales District Committee of the Welsh Board for Industry that experiments in dust suppression recently undertaken at several North Wales slate quarries are regarded as being successful. In process sheds with doors and windows closed, the air contained a concentration of 2000 dust particles per c.c. With suppression apparatus—a suction device above and beneath the cutting edge of the saw—the number of particles of dust was almost instantaneously reduced to less than 100 per c.c.

Stanlow Ceremony Postponed

The Shell Petroleum Company has postponed the official opening of the £4 million plant at Stanlow on July 20 because of the proclamation of a state of emergency. The plant was to have been opened by Sir Stafford Cripps.

Scottish Holidays

Most chemical plants in Glasgow closed down on July 15 and will be out of action for either one or two weeks. The majority of firms have made special arrangements for emergency needs, but the general policy has been to complete holidays within one period rather than "stagger" and continue understaffed.

Workers' Portraits

At a gathering at Stevenston, Ayrshire, recently, five members of the staff of the Nobel Division of I.C.I. received portraits which were painted as part of the I.C.I. publicity campaign, "Portraits of Industry." The five Nobel Division workers will retain their portraits as permanent mementoes of their service with I.C.I.

Belgian Farmers' Visit

A party of 20 Belgian farmers from the province of Namur was recently conducted on a three-day study tour of English farms by Mr. B. R. Crocker, of the Vizgol Oil Co., Ltd. The trip was the outcome of an invitation issued when Mr. Crocker took a party of young British farmers to Belgium earlier in the year.

New Tar Distilling Plant

Scottish Tar Distillers, Ltd., are to erect at Falkirk a modernised distilling plant at a cost of about £19,290. Approval for the work has been given at the Falkirk Dean of Guild Court. The Scottish tar distilling industry made a notable contribution of essential raw materials throughout the war and deferred modernisation of the industry's plant is now being systematically effected.

Firm's Record Steel Output

A new record of output has been reached by the United Steel Companies, Ltd., which produced 2,042,056 tons of steel ingots in the year ended June 30. This exceeded its target (2 million tons) and was also 146,000 tons higher than the record of the previous year. In a tribute to the employees of the firm at Sheffield, Rotherham, Scunthorpe and Workington, Mr. A. J. Peech, assistant managing director, said it was also a reward for the policy of modernising the plant.

• OVERSEAS •

Swiss Chromium Salts

A new plant for the production of chromium salts—principally sodium bichromate and chromic acid—has been installed by Gavalcron, A.G., Lugano.

Bolivian Tungsten Exports

Exports of tungsten ore from Bolivia in the first quarter of 1949 declined 21 per cent from the preceding quarter, totalling 610 short tons (60 per cent WO_3). Shipments during the corresponding period of 1948 amounted to 604 tons. During the first quarter of 1949, 98 per cent of tungsten exports was shipped to the U.S.A. and 2 per cent to the United Kingdom.

Oil Equipment Abandoned

A recent announcement by the Burmah Oil Company states that several million pounds' worth of equipment is being abandoned at the Central Burma oilfields of Yenaugyaung. The company has been forced to discontinue reconstruction work because of rebel activities. The British-owned Burmah Oil, Indo-Burma Petroleum, and British-Burma Petroleum companies are included in the withdrawal and are expected to move to Chauk, another oil town, 40 miles to the north.

Czech Products for U.S.A.

The Czech chemical process industries are stated to be exporting to the U.S.A. a number of products which were not formerly supplied, notably dental products, artificial leather, impregnated paper for packaging, cellophane and Vistra, an artificial fibre made from wood. Purchases from the U.S.A. will include crude oil, resins, dyes, asphalt, monazite, papaverine, pentaerythritol, etc. In 1948 such sales to America accounted for $20 million; $30 million worth of goods purchased from the U.S.A.

Proposed State Fertiliser Plant

The Icelandic Parliament has authorised the Government to construct and operate a nitrogen fertiliser plant, with a production capacity of 5000 to 10,000 metric tons annually, to cost approximately the equivalent of £1.75 million. The factory is to be under the control of a board of directors elected by the Parliament. The Icelandic Treasury will finance the original cost of construction. The plant is one of the projects in Iceland's long-term development programme, and is expected to take several years to complete.

Italian Oil Find

A further supply of oil is reported to have been tapped at Cortemaggiore in the Po valley. The new drilling is about 400 yards from the find reported last month, and is said to have started gushing when the drill reached a little less than 5000 ft.

Cellulose Acetate in Australia

A new undertaking to produce commercially cellulose acetate is to be undertaken by Colonial Sugar Refining Chemicals. The company's capital is stated to be £A3 million, and its factory, which will produce a number of chemicals not before made in Australia, is at Rhodes (N.S.W.).

Italian Lead and Zinc

Production of lead and zinc in Italy in 1949 is expected to reach the 1938 level, which was 32,770 tons of lead and 33,400 tons of zinc. Annual capacity of the zinc factories is now 44,000 tons, but shortage of power limits production. A long term European aid plan envisages, for 1952 or 1953, the completion of a new electrolytic plant with an annual capacity for 9000 tons of zinc, and the extension of three existing plants.

Increased Oil Charges

The terms of the agreement reached by the Iranian government and the Anglo-Iranian Oil Company revealed in Terheran this week provides that the royalty on all oil raised since 1947 shall be 6s. per ton (instead of 4s.), in accordance with which the company will be required at once to pay £3.36 million. The excise charge on oil is also raised from 9d. to 1s. per ton, requiring a further £600,000 for 1948. The company has also to pay 20 per cent of profits before deduction of British income tax. That change requires a further £5 million in respect of 1948.

New S. African Asbestos Mine

A new mine is reported to have been started about 10 miles north of Krugersdorp in the Witwatersrand, where it is believed rich veins of chrysotile occur. The operating company possesses options over about 1400 acres.

Canadian Rubber Record

Products of the Canadian rubber industry in 1947 have been valued at the record figure of $196,308,000. Sixty plants, with a total of 23,475 employees, were in operation during the year, and over 82 per cent of the entire output was from Ontario.

PERSONAL

Mr. J. P. Postlethwaite and Mr. F. L. Waring, following their recent appointment as joint managing directors of the three subsidiary companies of Coalite & Chemical Products, Ltd. (The Chemical Age, *60*, 766), have now also been made joint managing directors of the parent company, by which they have assumed full responsibility for the whole of the Coalite group.

Mr. Cecil John Taylor, a manufacturing chemist, of West Newton, near Carlisle, a prominent member of the Carlisle City Council, is the prospective Labour candidate for the new Penrith and Border Division of Cumberland. He was the Independent candidate for the Rusholme Division of Manchester in 1944. Earlier that year he was a prospective Independent candidate for Attercliffe, Sheffield, but arrived too late on the nomination day.

Dr. H. W. B. Skinner, deputy chief scientific officer in charge of the general physics division at the Atomic Energy Research Establishment, Harwell, has been appointed to the Lyon Jones chair of physics at Liverpool University. He succeeds Sir James Chadwick, the distinguished atomic scientist, who takes up an appointment as Master of Gonville and Caius College, Cambridge, in October.

Mr. John Green, director of Thomas Firth and John Brown, Ltd., and Mr. John James, chairman of the Lancashire Steel Corporation, Ltd., were among those who received from the King the accolade of Knight Bachelor at an investiture at Buckingham Palace last week.

Mr. B. W. Silverwood has recently been appointed technical commercial welding engineer to the Industrial Department of Philips Electrical, Ltd. Mr. Silverwood was recently elected secretary of the North London branch of the Institute of Welding in place of the late Dr. E. Sharratt.

Sir Alan Saunders has been selected to succeed Sir Francis Humphreys as chairman of the British Sugar Corporation, Ltd., with effect from August 1.

Mr. H. Sowerby, science master at New Mills Grammar School, Manchester, is to take up an appointment with the Atomic Energy Commission.

Mr. O. V. S. Bulleid, recently elected president of the Institute of Welding

Dr. F. R. Tubbs, who has been appointed director of the East Malling Research station in succession to Sir Ronald Hatton, took up his duties on July 1. Dr. Tubbs, who is 41, has carried out extensive investigations in Ceylon for the Tea Research Institute. Since 1948 he has been manager in charge of the horticultural division of the food research organisation of Lever Bros., and Unilever, Ltd., at Sharnbrook, Bedfordshire.

On passing the examination for the Fellowship of the Royal Institute of Chemistry, Mr. A. A. Rea, of the technical division concerned with Dunlop special products, Fort Dunlop, has been awarded £20 under the company's education scheme.

Mr. H. G. Welbergen is retiring from the position of general manager of Lumina Shell. He has been 31 years with Shell, 22 of which have been spent in Switzerland.

Mr. A. E. Young has been appointed managing director of the Glasgow Methylating Co., Ltd., of Glasgow and London.

Obituary

The death has occurred in France, at the age of 47, of Mr. Frank van Zwanenberg, chairman of Organon Laboratories, Ltd., London, and Newhouse, Lanark.

The death was reported last week from Vienna of Professor Otto Czadek, aged 76, a well-known authority on food chemistry.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH LIGNITE PRODUCTS, LTD., Bovey Tracey. (M., 23/7/49.) June 20, £5000 debenture, to Swithins Investment Trust Co., Ltd.; general charge. *Nil. Dec. 7, 1948.

DURHAM CHEMICALS, LTD. (formerly NEWCASTLE-UPON-TYNE ZINC OXIDE CO., LTD., & OUSEBURN TRADING CO., LTD.), Sunderland. (M., 23/7/49.) June 20, £809 14/2 mortgage, to Percy Building Society; charged on 4/6 Mitchell Street, Bittley. *£65,938. April 7, 1948.

F. H. STEELE & CO., LTD., Dublin, manufacturing chemists, etc. (M., 23/7/49.) May 23, £10,000 debenture; charged on 22 Brookfield Avenue, Blackrock, Co. Dublin, also general charge. *Nil. March 17, 1949.

Satisfaction

BRITISH THOMSON-HOUSTON CO., LTD., London, W.C., electrical manufacturers. (M.S., 23/7/49.) Satisfaction June 23, of Trust Deed registered December 17, 1921 (fully).

Company News

Beecham Group, Ltd.

The directors of Beecham Group, Ltd., announce that in the year ended March 31, 1949, after providing for all charges, there is a surplus available for the deferred shares and reserves of £517,345 compared with £751,511 in the previous year. The directors do not propose to recommend any final dividend on the deferred shares (4 per cent last year). The distribution of 36 per cent, less tax, already made on the deferred shares absorbed £299,475. The profit on home, export and overseas business was £1,905,194 (£2,370,181).

The Manufactures des Glaces et Produits Chimiques Saint-Gobain

The French glass and chemical group, which owns a number of foreign subsidiaries, reports for 1948 a net profit of Fr.302 million (Fr.168 million). Dividend has been increased from Fr.41.25 to Fr.60 per share.

Etablissements Kuhlmann

The Etablissements Kuhlmann Manufactures de Produits Chimiques du Nord reports for 1948 a net profit of Fr.248 million (Fr.114 million). Dividend Fr.80 (Fr.40), equal to 10 per cent (same) net per share.

The registered capital of THE YORKSHIRE DYEWARE & CHEMICAL CO., LTD., has been increased by £250,000 to £800,000. The board's intention to redeem the outstanding £56,513 four-and-a-half per cent first mortgage debenture stock is also announced.

New Companies Registered

Collins and Jervie (Amersham), Ltd.

Private company. (470,619). Capital £1000. Manufacturing chemists. Directors: M. Valentine, D. M. Fry. Reg. office: 6 Sycamore Road, Amersham, Bucks.

G. & P. (Proprietaries), Ltd.

Private company. (470,709). Capital £10,000. Objects: To acquire the business of the Imperial Steel Company carried on at Sunderland; and to carry on the business of manufacturers of detergent tablets, chemicals and chemical products, acids, plasters, disinfectants, fertilisers, etc. Directors: W. A. Green, R. Porter. Reg. office: Sunniside Chambers, St. Thomas Street, Sunderland.

Niro Atomizer & Engineering, Ltd.

Private company. (470,717). Capital £5000. Manufacturers of atomisers, spray drying equipment, machinery for converting liquids into solids or solids into liquids or gaseous state. Directors: K. S. Openheimer, J. E. Nyrop, F. B. Cornwell, S. Squires. Reg. Office: 232 Gt. Portland Street, W.1.

The name of CHEMICAL INDUSTRIAL PRODUCTS (HULL), LTD., Equitable Chambers, Central Street, Halifax, has been changed to CHEMICAL INDUSTRIAL PRODUCTS (KEMMAL), LTD.

The name of L.P.C. LEAD PIGMENTS & CHEMICALS, LTD., 7 Gracechurch Street, E.C., has been changed to L.P.C. CHEMICALS & DYES, LTD.

Chemical and Allied Stocks and Shares

BUSINESS in stock markets remained on a moderate scale, but, with little selling, a firm appearance developed and British Funds and industrial shares tended to show small gains on balance. Sentiment was helped by the hope that, having regard to the successful outcome of the conference of Commonwealth finance ministers, it may not be necessary to make further reductions in imports of dollar goods in the autumn.

Shares of companies with important interests in the U.S., and also those of companies which may increase their exports of goods to dollar countries, are favoured to some extent as are shares of commodity companies, such as rubber and base metal mines. But there may be little prospect of commodity companies earning better profits unless the U.S.A. is willing to pay higher prices for stockpiling purposes.

As was to be expected, shares of chemical and associated companies were helped by the better trend of markets. Imperial Chemical firmed up to 44s. 4½d., Turner & Newall have risen to 76s. 6d., United Molasses to 39s. and Borax Consolidated were steady at 50s. Later, however, Imperial Chemical came back to 44s. 1½d. British Oxygen have been firm at 92s. 9d. while British Aluminium were steady at 43s. 9d. Ilford rallied well to 21s. 10½d. and Monsanto were better at 53s. 1½d.

Albright & Wilson have remained at 27s. 9d. and Boake Roberts at 30s. Bowman Chemical 4s. shares were 7s., F. W. Berk 2s. 6d. ordinary 13s. and Amber Chemical 2s. shares 5s., while Brotherton 10s. ordinary were again at 20s. and Pest Control 5s. shares at 8s.

Among preference shares, L. B. Holliday 4½ per cent were 21s. 9d., W. J. Bush 5 per cent 24s. 9d., and British Chemicals & Biologicals 4 per cent firmed up to 20s. 6d. B. Laporte 5s. ordinary strengthened further to 21s. on the latest developments.

Cement shares have attracted more attention at higher prices, Tunnel at 49s. 3d. responding to the higher profits and increased dividend, while Associated Cement were 76s. 3d. and British Portland 73s. 9d. British Plaster Board at 23s. 4½d. responded further to the results and bonus. British Match at 33s. and Lever & Unilever at 47s. 3d. have been firm on further consideration of the past year's figures. Triplex Glass 10s. shares have changed hands over 20s. on market talk of good results and a possible share bonus.

Boots Drug (50s.) have been firm on the full report and accounts, Glaxo Laboratories, after easing, firmed up to £17⅞, British Industrial Plastics 2s. shares improved to 4s. 10½d., and De La Rue were better at 27s. and British Xylonite 67s. 6d.

Beechams deferred at 13s. 3d. were unaffected by the lower dividend, Sangers 5s. ordinary have been firm at 29s., Griffiths Hughes at 18s. 9d. and British Glues 18s. 3d.

Oil shares moved irregularly, although Apex Trinidad were good at 33s. Anglo-Iranian at £7 19/32 were easier on official news of the outcome of the negotiations with the Persian Government.

British Chemical Prices

TRADING conditions on the industrial chemicals market remain fairly brisk, with the movement to the main consuming industries continuing on a satisfactory scale. Since last week an increase in the controlled price of pig lead has been notified and the prices for white lead and red lead have been advanced accordingly. White lead is now £109 10s. per ton and red lead £99 per ton. The majority of the soda compounds continue in good demand with supplies of soda ash and caustic soda being fully taken up. The potash chemicals generally remain firm. Formaldehyde, borax, hydrogen peroxide and the barium compounds are other items which are attracting a fair amount of buying interest. Subdued conditions persist on the coal-tar products market and buying both for home and for shipment has only been of moderate extent.

MANCHESTER.—The past week has been little change of any consequence in trading conditions on the Manchester chemical market, although the uncertainty regarding future price movements of non-ferrous metal products tends to make for cautious buying. In most other directions, delivery specifications, especially for the alkalis and other leading heavy chemicals, has covered a steady tonnage, but holiday conditions continue to affect the volume.

GLASGOW.—The volume of business transacted in the Scottish chemical market during the past week has been very restricted, because of the holidays, with very little buying being done. There have been a few price changes, mainly decreases in price, among which the rise in value of bleaching powder was a notable exception.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production from acetylene of aromatic hydrocarbons and of saturated and unsaturated hydrocarbons.—Synben Akt.-Ges. Nov. 19, 1940. 623,722.

Compositions containing aminotriazine-aldehyde condensation products and methods of preparing same.—American Cyanamid Co. July 31, 1942. 623,355.

Coating of non-fibrous cellulosic bodies.—American Cyanamid Co. April 30, 1943. 623,357.

Alloy iron castings and method of producing the same.—Hepworth & Grandage, Ltd., and H. Forrest. Jan. 4, 1945. 623,360.

Colloidal aqueous dispersion of a resinous copolymer of melamine, urea and formaldehyde.—American Cyanamid Co. Jan. 4, 1944. (Addition to 623,355.) 623,361.

Melamine - formaldehyde condensation product dispersions.—American Cyanamid Co. Dec. 30, 1943. (Addition to 623,355.) 623,362.

Anti-toxic agents.—J. F. Danielli, P. D. Mitchell, M. Danielli, L. N. Owen and G. Shaw. Dec. 10, 1945. 623,377.

Variable resistors particularly for measuring devices.—Liquidometer Corporation. Sept. 24, 1945. 623,637.

Apparatus for the conveyance of liquids to atomising discs.—C. Andermatt. March 17, 1945. 623,731.

Machines for the manufacture of stranded textile filaments.—M. Kaplinsky. June 28, 1945. 623,384.

Sterilisation of partially oxidised cellulose fibres and means for effecting the same.—Parke, Davis & Co. June 18, 1945. 623,733.

Distilling and rectifying apparatus.—Union Chimique Belge Soc. Anon. April 25, 1945. 623,388.

Plasticised polyvinyl and polyvinylidene resin compositions.—L. Berger & Sons, Ltd. (Sherwin-Williams Co.). May 24, 1946. 623,743.

Tools for use in opening and sealing drums and the like containers.—British Industrial Solvents, Ltd., and R. M. Howell. May 31, 1946. 623,394.

Processes and apparatus for the regeneration of spent iron and steel acid pickle liquors.—N. Swindin. June 6, 1946. 623,446.

Manufacture of nitro-dyestuffs.—British Celanese, Ltd. June 21, 1945. 623,399.

Device for applying chemicals and minerals for therapeutic purposes.—F. Schwab. June 27, 1946. 623,400.

Liquid measuring and filling means for containers, tins and the like.—R. Abrahamsen. Aug. 21, 1940. 623,562.

Insulating coverings particularly for castings and method of forming same.—Ferro Engineering Co. July 28, 1945. 623,642.

Production of viscose.—Rayonier, Inc. Nov. 27, 1945. 623,566.

Preparation of dialkyl esters of fumaric acid from maleic anhydride.—Wingfoot Corporation. March 13, 1946. 623,409.

Dehydro-iso-androsterone and process of producing the same.—Glidden Co. May 8, 1946. 623,754.

Derivatives of polyvinylisocyanate.—General Aniline & Film Corporation. Oct. 23, 1945. 623,416.

Polyvinylisocyanate and derivatives thereof.—General Aniline & Film Corporation. Oct. 23, 1945. 623,417.

Preparation of boron hydrides.—British Thomson-Houston Co., Ltd. Oct. 22, 1945. 623,760, 623,761.

Process of recovery of hard metal carbides from sintered hard metal scrap.—E. A. Pokorny and H. W. Pokorny. Oct. 24, 1946. 623,577.

Manufacture of bodies of chemically reactive carbon for use as a reagent in certain chemical reactions.—C.U.R.A. Patents, Ltd., W. J. Kramers and M. Pirani. Oct. 28, 1946. 623,764.

Manufacture of gel catalysts.—Standard Oil Development Co. Dec. 6, 1945. 623,578.

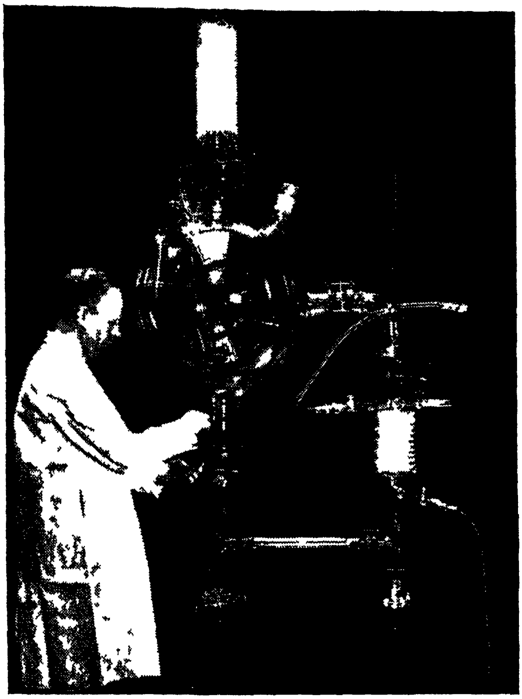
Process for effecting the adhesion of two or more plies of fabric to form a laminated sheet.—A. Felix, J. J. Horn, M. Horn and H. Horn. Oct. 30, 1946. (Cognate Application 17456/47.) 623,579.

Aluminium-magnesium alloys. — Acme Aluminium Alloys, Inc. Nov 27, 1945. 623,452, 623,453.

Recovery of ethylene oxide.—Distillers Co., Ltd., and F. J. Wilkins. Nov. 13, 1946. 623,583.

Manufacture of derivatives of the cyclopentanopolyhydrophenanthrene series.—Ciba, Ltd. Nov. 30, 1945. (Cognate Applications 34888/46, 34889/46 and 34890/46.) 623,586.

Process for the manufacture of cyclohexane by catalytic hydrogenation of benzene in the vapour phase.—Naamlooze



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Venootschap de Bataafsche Petroleum Maatschappij. Dec. 20, 1945. 623,425.

Vibration dampeners.—Jack & Heintz Precision Industries, Inc. Jan. 5, 1946. 623,426.

Methods of and apparatus for manufacturing articles by extrusion.—E. C. Snelgrove. Dec. 7, 1946. (Cognate Applications 37083/46 and 606/47.) 623,773.

Manufacture of para-nitrobenzine sulphonylchloride.—Allied Chemical & Dye Corporation and H. J. Fitzpatrick. Dec 13, 1946. (Addition to 602,597.) 623,774.

Manufacture of substituted ethylenes.—Ciba, Ltd. Dec. 22, 1945. (Cognate Application 37279/46.) (Addition to 600,696.) 623,428.

Manufacture of dyestuff preparations.—Ciba, Ltd. Dec. 22, 1945. (Cognate Application 37282/46.) 623,429.

Micro-hardness tester.—E. B. Bergsman. Dec. 24, 1946. 623,432.

Pigment compositions. — American Cyanamid Co. Jan. 25, 1946. 623,590.

Green pigment compositions.—American Cyanamid Co. March 7, 1946. 623,593.

Apparatus for washing out oil tanks, vats, and the like containers.—Merryweather & Sons, Ltd., R. E. Stubington and L. C. Miller. Feb. 4, 1947. 623,780.

Catalysts.—Imperial Chemical Industries, Ltd., and P. W. Reynolds. Feb. 26, 1947. 623,595.

Method of treating a tow of filaments or threads.—Imperial Chemical Industries, Ltd., R. H. K. Thomson, W. E. Tetlaw and A. M. McDonald. March 10, 1947. 623,460.

Method of producing 5:6-dimethoxy-8-aminoquinoline.—T. A. Williamson. April 8, 1946. 623,789.

Preparation of cellulose ethers.—Hercules Powder Co. Dec. 24, 1946. 623,607.

Polymerisation of ethylenically unsaturated compounds.—E. I. Du Pont de Nemours & Co. April 26, 1946. 623,472.

Conveyors.—J. Collis & Sons, Ltd., and L. A. Collis. May 1, 1947. 623,481.

Process for the manufacture of 2-carboxymethylmercaptobenzine stibonic acid. —F. Hoffman-La Roche & Co. Akt.-Ges. June 14, 1946. 623,488.

Pulverising of sulphur and like materials.—A. J. Sturges-Beer. May 5, 1947. 623,499.

Manufacture of glycol esters of terephthalic acid.—Imperial Chemical Industries, Ltd., and A. C. Farthing. May 9, 1947. 623,669.

Valves for the control of fluid-flow.—W. B. Monteath and S. C. McBirnie. May 14, 1947. 623,696.

Heating or cooling apparatus for liquids or semi-liquids.—B. D. Winser. May 14, 1947. 623,699.

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Volume LXI 30 July 1949 Number 1568

Future of British Minerals

SELDOM has a Government-sponsored report representing the results of detailed and necessarily protracted inquiries made its appearance more opportunely than the Report of the Mineral Development Committee.* It will stand as one of the comparatively few redeeming features of Mr. Emanuel Shinwell's term of office as Minister of Fuel and Power that he was at least officially responsible for the appointment, in August, 1946, of the committee of 12, including mining experts, under the chairmanship of Lord Westwood, whose report on mineral resources and prospects in the United Kingdom now comes to hand—at a time when the likelihood of diminished purchases from overseas makes vitally important any evidence which can lead to enlargement of home supplies. While the report is more of a stocktaking document than a blueprint for new production, it has many constructive suggestions, which deserve an impartial hearing, uncoloured by the dislike that will inevitably be felt for one of its fundamental proposals—that the State should control the further exploitation of a wide group of mineral ores. That is suggested as one of the functions of a Mineral Development Commission, and the present Minister of Fuel has conferred official blessing on that proposal.

No fair judgment of this recommendation can be formed without taking account of the effect of the Town and Country Planning Acts, which have already deprived all owers of unexploited minerals of the right to benefit from their development. The deplorable result of that legislation has been to remove all incentive to new mineral development by private owners, from whom "development value" of land has been transferred to the Central Land Board. It is to be noted, however, that one of the committee, Mr. Peter Thornycroft, M.P., dissociated himself from the proposal to set up a commission.

At the time of its appointment and during much of the period in which the investigations were carried out, the committee could not foresee to what extremities we were to be driven in 1949 by the dissipation of hard currency. Had that been possible, the committee might have made its contribution somewhat more valuable by appending a more specialised study of the possibilities—limited though they may be—of substituting home produced minerals for some of those which we may soon be obliged to take on a considerably less liberal scale from the traditional foreign producers. The

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* Report of the Mineral Development Committee, Cmd 7732 , the Ministry of Fuel and Power.

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present report and the uncomfortable economic tidings with which it has more or less coincided do clearly indicate the need for an investigation on those lines by a full-scale commission, rather than a specialised committee such as this, whose limited terms of reference were formidable enough.

The committee had in mind something of this sort when it framed the recommendation which appears in the final summary: that there should be set up a Mineral Development Commission on lines similar to the Coal Commission, to work in close collaboration with the Geological Survey (DSIR). The corollary that the commission should acquire the ownership "of certain specified minerals" opens up highly unattractive posibilities, but other suggested functions, such as the promotion and co-ordination of research and the granting of financial aid to private mining, do tend to compensate for this further step towards centralisation.

The committee, disregarding "coal, oil, bedded ironstone and substances of widespread occurrence" (gravel, slate, etc.) has concentrated on tin, tungsten, lead, haematite iron and zinc ores and 14 non-metal deposits. The last, headed by barytes, barium brines, witherite and fluorspar, in that order, included china clay, ball clays, gypsum, anhydrite, salt, potash, fullers' earth, talc, serpentine and glass sand. Nearly all these minerals are of the utmost interest to chemical industries, and wherever the special committee has been able to point to possibilities of raising production totals it has performed a useful service for those industries. Having regard to the fact that mineral prospecting in the United Kingdom was old long before many of the better known producing areas were opened up, it is not to be expected that there are now easily unexplored deposits sufficiently large to change the supply position in short time.

The committee has possibly understated the prospects, but so far from discouraging potential mining developments, it has underscored in more than one section of the report the urgent need for new enterprises, and has also pointed to some of the factors which hindered growth in the past. The committee estimates, for example, that if the 1947 output is maintained, present deposits of tin and wolfram concentrates will be exhausted in less than ten years. On the same

(*continued on page* 140)

Notes and Comments

Export Cuts

THE disquieting evidence which June has yielded of some weakening in United Kingdom export trade has necessarily had its counterpart in the totals of heavy chemicals sold overseas. That there has been some setback in sales of industrial chemicals, and notably some which are regarded as basic from the standpoint of production here and of needs of foreign industry, is evident. One of the more conspicuous pointers in this connection is what has been happening in the widely used group of sodium chemicals. Sales of sodium carbonate, soda ash, etc., have dwindled from some 383,000 cwt. in June, 1948, to 299,000 in May this year, and last month had dropped steeply to 150,372 cwt. That item alone represents a fall of more than £200,000 in the monthly earnings in June in the two years. Caustic soda has experienced a rather less severe reduction, from some 203,000 cwt. a year ago to 157,998 cwt. last June, and a notable rally a month before to over 254,000 cwt. has helped to keep the long-term account on a rather steadier basis. Among the many factors which had contributed to this change in prospects for these traditionally large items in the chemical trading account the accumulation of surpluses in several parts of the world, not long released from conditions of acute scarcity, is fairly widespread: for example, in India, where severe buying cuts have been made. The evidence yielded in the current *Trade and Navigation Accounts* of the large help which British countries as a whole have given to uphold the sodium chemicals trading account might well be taken as a timely hint in framing future overseas trading policy. While the total yield of chemicals, disregarding drugs and dyestuffs, £3,665,357, was almost £1 million less than was realised in May, the result was, in fact, little over £200,000 less profitable than in June last year.

Coal Facts

GOOD news about coal is rare, so that the rather better tidings just given by Sir Arthur Street, deputy chairman of the National Coal Board, in Birmingham last week-end were imbued with scarcity value. He disclosed that in the first half of this year coal output topped 102 million tons, compared with 99.78 million tons at this time last year. Rather more promising were the facts he quoted to show that the gradual climb to better results was a long continued process still operating, although at a rather slackened rate. Compared with the low level record of 175 million tons of deep mined coal raised in 1945 and the subsequent 180, 186 and 197 million tons in 1946, 1947 and 1948, the present rate of output can readily be made to appear phenomenal—provided what was commonly raised before the current outlook on the function of coal mines is rigidly excluded from view.

Earnings and Output

FROM that modified standpoint, there are good grounds for relief in some of the points raised by Sir Arthur Street and amplified in this week's publication by the NCB, "Coal Figures." Output per manshift at the face has risen from 2.76 tons in 1946 to just three tons throughout the first half of this year, and there has been an even steeper rise in the first quarter of this year. It is no doubt ungracious to recall that miners were averaging three tons per shift in 1938. "Coal Figures"—which has nothing to say about coal prices—discloses that the average weekly earning, including 8s. allowances, of miners in the first quarter of the year was £8 18s. 7d.

Chemical Crop Protection

THE comparatively lukewarm interest shown by farmers in pest control products and their failure to make the best use of them, despite their influence on crop protection, was the subject for comment by Lord Bledisloe when, as president, he recently opened the second International Crop Protection Congress in London. While the fruit-grower appreciates the value of pest control and weed killers are slightly more freely used, it seems that the farmer still retains much of his traditional conservative outlook on the newer chemical aids to husbandry. Market research by such organisations as Shell Chemicals' horticultural section, and the farm service of Shell-Mex confirms this, and although the various pest control products are already marketed at prices which make their use economically practicable, greater use and more co-operation by the farmers would almost certainly enable the cost to be further reduced.

Smokers' Cure ?

THE Americans have an engaging readiness to look at commonplace materials with a speculative eye. It is a commendable habit which in the persons of some of this country's early industrial chemists, produced returns of almost fabulous proportions. That result is perhaps not to be expected from current investigations in the Ohio State University, Columbus, of what goes to make up cigarette smoke. The quick answer here might well be "about 90 per cent Customs duty." The American workers, fortunately, are still able to take an unimpassioned view, and have determined that each average cigarette produces in burning two distinct smoke streams, that which is drawn through the cigarette and is predominantly acid in character, and the secondary stream emitted from the glowing end, which is alkaline. Smoking—mechanically—200 cigarettes in an 8-hour day, the U.S. workers have established that the average American cigarette provides the smoker with all these incidentals: 4.3 ml. carbon monoxide, 7.7 per cent by volume carbon dioxide, equivalent to 34 ml. per cigarette; hydrogen sulphide 0.0019 per cent by volume of gaseous phase. Hydrogen cyanide was not detected. Acetylene was found in the cigarette smoke and there were some other unsaturated hydrocarbons. Now we know why these chemical generators used to be called "gaspers."

FUTURE OF BRITISH MINERALS

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accounting basis, barytes, witherite, fluorspar and haematite iron ore might also be exhausted within 10 to 20 years if no supplementary supplies are added in that period. Salt, anhydrite and gypsum may serve for 50 years or so.

The assumption that we shall be content to go on living on our present mineral capital without taking any effectual steps to add to it is not seriously entertained, and there are several indications that the age of mineral discovery here is not nearly ended. Possibly the most encouraging factor in this connection is the considerable advances in mining technology and even greater development of equipment made since many of the older mineral workings were abandoned as being uneconomic. One is reminded of the great increase represented by the modern capacity for plumbing great depths and tapping soluble salts by pumping in the committee's revelations about what has been brought to light in recent times from the exploratory borehole sunk by the D'Arcy Exploration Co., Ltd., at Aislaby, near Whitby, in 1938. The outstanding fact is that from this borehole came evidence that potash lies there. This was the first proof that K_2O exists, in this case as about 45 ft. of polyhalite of 15.6 per cent potash content at about 4500 ft., interspersed with salt beds and potasium chloride.

It is scarcely likely that this will prove the last "windfall" that deep exploration is to yield, so that the obligation to press on with all similar work cannot be disregarded. There remains, however, the widespread conviction that these ends would be more directly approached by the expert mining groups and the Geological Survey without help from the Ministry of Fuel.

LEAD AND ZINC PRICES

Official Rates Raised Again

THE third revision within three weeks of lead and zinc prices, reflecting the intimate dependence of Ministry of Supply trading upon the American market, has been announced this week. Good soft pig lead is raised (per ton) by £1 7s. 6d. to £82 7s. 6d., and good ordinary brand zinc by £2 15s. to £63 10s.

These increases are evidently influenced by a fresh advance in U.S. prices. Lead in New York was, on July 25, raised by ¼c. to 14¼c. per lb. and zinc by ½c. to 10c. Similar increases have been made by the Consolidated Mining and Smelting Co. of Canada.

The recent Ministry of Supply price fluctuations (THE CHEMICAL AGE, *61*, 78 and 11) have been these:—

GOOD SOFT PIG LEAD

	New price	*Old price*
	£ s.	£ s.
July 12	75 10	82 0
July 14	81 0	75 10

GOOD ORDINARY BRAND ZINC

	New price	*Old price*
	£ s.	£ s.
July 12	58 0	78 0
July 19	60 15	58 0

THE 29th BIF

APPLICATIONS have already been received for more than half of the total space available at the 29th British Industries Fair at Earls Court and Olympia in London. (May 8 to 19, 1950.) In Birmingham, where a similar proportion has been received by the Chamber of Commerce, extensions are being made to the outdoor section.

In the London section over 800 exhibitors have applied for more than 300,000 sq. ft. out of a maximum of 555,000 available. Requests for space are being made in numbers similar to last year, but as the closing date for applications has been advanced by two weeks, to July 30, 1949, there may be a sharp increase in the waiting list of late applicants. By mid-August, nine months before the Fair, the organisers must assess the scale on which each industry will be represented.

At Birmingham, there is no fixed closing date and the rate of application is well up to last year. By conversion of 40,000 sq. ft. of car park, the available space will be increased to 450,000 sq. ft., making possible a special display of British contractors' plant.

LINSEED OIL SUBSTITUTE

Promising Research at Liverpool

SCIENTISTS at Liverpool University have succeeded in producing a substitute for linseed oil from the seed of a West African wild vine. Lord Hankey, chairman of the Colonial Products Research Council, described it in the House of Lords on July 19 as a very promising and valuable substitute. The botanical name of the wild vine is *tetracarpidium conophorum*, and the oil is called conophor oil. Before it can be determined whether the oil can be produced in bulk it has to be ascertained whether the wild vine will grow as a cultivated crop, and experiments on these lines are being made in Nigeria.

Prof. T. P. Hilditch, professor of industrial chemistry at Liverpool University—distinguished for his work on the chemistry of natural fats—has been working at the head of a small group of scientists in the university laboratory for the past six years on the seed of the wild vine. " It is two years since we reported that it might be useful," he said recently, " but progress is bound to be slowed down, because the vine takes two years to flower. It is not like flax which gives a yearly crop. I know that they are taking the job of cultivating the vine very seriously in Nigeria, and they are getting some interesting results. It might be ten years before the vine is really under full cultivation."

A Colonial Products Research Council report says says success depends upon the possibility of producing at least 10,000 tons of oil a year. The spasmodic production of a few tons or hundreds of tons of a drying oil would be of no permanent interest to the paint and varnish industry. Commercial tests have been undertaken by firms engaged in this industry and the linoleum industry. If available in quantity, conophor oil would be a very welcome addition to the world's supplies of drying oils.

Among members of the Liverpool University research team in the early experiments under Prof. Hilditch were Dr. F. D. Gunstone, who afterwards took up an appointment at Glasgow University, and Dr. J. P. Riley.

Higher Employment Rate

The unemployment figure for the month ended June 13 was 263,643, a drop of 40,522 from that of the previous month. This was the lowest figure for two years.

REDUCED CHEMICAL EXPORTS

June Total was £1 Million Less

CHEMICAL exports from the United Kingdom in June, with a total of £6,947,307, showed a decrease of £1,144,442 from the May figure of £8,091,749, and were £222,459 less than in June, 1948. Notable decreases from May totals include formic acid from 5641 cwt. to 1973 cwt.; salicylic acid from 173,534 lb. to 120,362 lb.; ammonium nitrate from 10,644 tons to 3883 tons; tar oil from 4,077,401 gal. to 1,129,355 gal.; nickel salts from 6214 cwt. to 3672 cwt.; salt from 23,479 tons to 15,321 tons; sodium carbonate from 299,649 cwt. to 150,372 cwt.; caustic soda from 254,561 cwt. to 157,998 cwt. The total figure for exports of paints, pigments and colours fell from 195,218 cwt. to 155,894 cwt.

CHEMICAL EXPORTS

	June 1949	June 1948
	Cwt.	Cwt.
Formic acid	1,973	3,751
	Lb.	Lb.
Salicyclic acid and salicylates ...	120,362	204,372
Value of all other sorts of acid ...	£92,827	£80,756
	Tons	Tons
Aluminium oxide	47	374
Sulphate of alumina	3,405	4,791
All other sorts of aluminium compounds	366	414
Ammonium sulphate	33,262	23,577
Ammonium nitrate	3883	2,129
All other sorts of ammonium compounds	1,193	1,591
	Cwt.	Cwt.
Bleaching powder	29,752	28,299
All other bleaching materials ...	9,711	12,178
	Gal.	Gal.
Cresylic acid	83,565	199,510
Tar oil, creosote oil, anthracene oil, etc.	1,129,355	2,949,045
Value of all other sorts of tar oil	£18,007	£25,980
	Cwt.	Cwt.
Collodion cotton	3,343	1,348
	Tons	Tons
Copper sulphate	4,988	1,982
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	52,275	54,545
	Tons	Tons
Fertilisers	811	3,777
	Cwt.	Cwt.
Nickel salts	3,672	3,504
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	4,774	9,406
	Gal.	Gal.
Tetra-ethyl lead	86,586	117,521
	Tons	Tons
Magnesium compounds	597	1,049
	Gal.	Gal.
Methyl alcohol	4,438	1,244
	Cwt.	Cwt.
Potassium compounds	4,751	5,548
	Tons	Tons
Salt	15,321	18,616
	Cwt.	Cwt.
Sodium carbonate...	150,372	383,354
Caustic soda	157,998	203,753
Sodium silicate	17,045	18,050
Sodium sulphate	65,725	79,675
All other sodium compounds ...	59,592	84,099
Cream of tartar	198	235
Tin oxide	495	571
	Tons	Tons
Zinc oxide	838	1,060
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,665,357	£3,891,303
	Oz.	Oz.
Quinine and quinine salts ...	166,573	284,269
	Lb.	Lb.
Acetyl-salicyclic acid	135,286	55,885
	100 International units	100 International units
Insulin	943,679	844,784
	Mega units	Mega units
Penicillin	683,863	334,006
Total value of drugs, medicines, and preparations	£1,676,732	£1,433,079
Total value of dyes and dyestuffs ...	£732,534	£751,305
	Cwt.	Cwt.
Plastic materials	33,344	29,474
Value	£426,268	£363,659
	Cwt.	Cwt.
Chemical glassware	1,008	1,828
Value	£44,575	£55,687
	Cwt.	Tons
Fans	3,342	128
Value	£104,353	£89,761
	Cwt.	Tons
Furnace plant	6,834	559
Value	£81,972	£66,344
	Cwt.	Tons
Gas and chemical machinery ...	18,950	808
Value	£214,310	£132,773

CHEMICAL IMPORTS

	June 1949	June 1948
	Cwt.	Cwt.
Acetic acid	5,744	18,085
Boric acid	11,440	6,852
All other sorts	3,537	5,938
Borax	18,200	27,645
Calcium carbide	--	23,005
Coal tar products (excluding benzol and cresylic acid) ...	—	14,237
Cobalt oxides	--	54
	Tons	Tons
Arsenic	160	--
Fertilisers	123	297
	Lb.	Lb.
Iodine	66,050	132,301
	Cwt.	Cwt.
Potassium chloride	1,021,250	963,988
Potassium sulphate	12,100	26,630
All other potassium compounds...	3,166	5,602
Sodium nitrate	81,093	161,738
All other sodium compounds ...	2,283	5,664
Carbon blacks (from natural gas)	10,410	92,639
Total value of chemicals, drugs, dyes and colours	£2,161,126	£2,815,106

First British Potash Deposits

Report of the Mineral Development Committee

THE first connected account to the present time of the sequence of events related to the discovery in North Yorkshire, shortly before the war, of the only recorded potash deposits in England, is provided by the newly issued report of the Mineral Development Committee (this issue THE CHEMICAL AGE, page 137). The committee was set up by the Minister of Fuel (then Mr. E. Shinwell) in August, 1946.

The report recalls that in 1938-39 an exploratory borehole for oil was sunk by the D'Arcy Exploration Co., Ltd., at Aislaby, near Whitby. A detailed statement of the early information revealed by the borehole was given by Dr. G. M. Lees and Mr. A. H. Taitt (of the D'Arcy Exploration Co.) to the Geological Society of London on December 6, 1944, and published in the quarterly journal of that society in February, 1946.

Summarised, this statement notes that a salt bed was recorded at a depth of 3655-3680 ft., containing not more than 1 per cent potassium chloride (KCl), with a thin band of 3.2 per cent KCl at 3800 ft. A second salt bed from 3920-4193 ft. contained a thin bed of " sylvinite " with up to 34 per cent KCl. Further records of KCl were obtained immediately below this, but owing to incomplete core recovery, the exact thickness and quantity were unknown.

Deep Deposit

A third salt bed from 4312-4775 ft. contained a solid bed of polyhalite with 15.6 per cent potash (K_2O) about 45 ft. thick. Natural gas, about 95 per cent methane, under a pressure of 1650 lb. per sq. in., was struck at 4212 ft. A short test gave gas production at the rate of 2.5 million cu. ft. per day.

Near the base of the borehole at a depth of 4870 ft., water was encountered, the analysis of which showed 11,370. 1036 and 19.028 parts per hundred thousand sodium (Na), potassium (K) and chlorine (Cl) respectively. This represents almost a saturated solution of brine, containing, in addition, some KCl in solution. Owing to the collapse of the borehole, particularly at the salt horizons, the existing borehole could not be used for any further exploration or for longer pumping tests on the supply of natural gas and brine available.

Geological evidence from the borehole and the surrounding district suggests that salt beds of the type recorded are likely to occupy a considerable area extending mainly eastwards and not to be isolated, or fortuitous occurrences. Such deposits are stated to have been produced by the evaporation in Permian times of a sea, called the Zechstein Sea, long known to geologists as having once extended across North Germany to East Britain. Important deposits of similar salts which accumulated in the same area have been worked in Germany on a large scale for many years.

Two Potash Sources

It will be noted that the existence of two different potash salts has been recorded; sylvinite, containing KCl, and polyhalite, containing potassium sulphate. Of the two the former is by far the more important as a raw material for manufacturing fertilisers. Unfortunately, for technical reasons and because the boring was for oil, the recovery of the core from the borehole was incomplete in the salt horizons where KCl was recorded.

The attention of Imperial Chemical Industries, Ltd., was drawn by the D'Arcy Company to the salt deposits, which were not then known to contain potash salts, and they were invited to examine the borehole cores. The salts were found to consist chiefly of common salt (sodium chloride), anhydrite (calcium sulphate), sylvinite (mixed potassium and sodium chloride). Polyhalite (a hydrous sulphate of calcium, magnesium and potassium) was afterwards recognised to be present by Prof. W. G. Fearnsides and Prof. C E. Tilley.

In Abeyance

No action was taken in regard to further exploration until 1948. Prior to that time, I.C.I, Ltd., which was already working anhydrite and salt further north in the Teeside area, did not consider the information then available justified further exploration from the commercial standpoint. However, in 1943 it drew the attention of the Ministry of Supply to the occurrence in view of a possible decision by that Ministry to undertake exploration as a wartime emergency measure.

This information was brought to the

attention of the Non-Ferrous Metallic Ores Committee (chairman, Sir William Larke, K.B.E.), which reported that the discovery was potentially important and recommended that if home-produced potash was required, immediate steps should be taken to ascertain the extent and thickness of the deposits by means of further exploratory boreholes. This report also recommended that the mineral rights covering the potash occurrences should be nationalised.

It was eventually decided not to proceed at that time, since it appeared that even should further boring give favourable results, the opening up of a mine at that depth to develop the deposits would be a long-term undertaking and costly in money and manpower. Other ways of working the occurrences, *i.e.*, by pumping the brine at the base of the borehole, were apparently not considered.

Potential Value

In September, 1946, immediately after its appointment, the Mineral Development Committee thought the facts should be re-examined without delay in view of the potential importance of the discovery. I.C.I. kindly supplied the committee with further reports and I.C.I.'s attention was naturally centred on the possible value of the substantial deposit of polyhalite. That company's opinion at the time was that, while more information about the deposits was essential, and because further boreholes would be costly, the committee should arrange some preliminary research work on the value of polyhalite as a fertiliser and investigate the cost and practicability of mining it at about 4500 ft.

The existence of the methane gas under pressure immediately above the polyhalite would have added to the mining difficulties From the commercial point of view, I.C.I. doubted whether, on the facts available, the project could compete with imported potash. The committee ascertained that, although research in America suggested that such mineral had some value as a fertiliser when untreated, it could not yet be stated that it would be worth winning from this depth, or that if it needed further chemical treatment the final product would not be too costly.

In December, 1947, after further discussion with Dr. G. M. Lees, Prof. S. E. Hollingworth and the Geological Survey at a special meeting decided that, subject to the results of further boring and pumping tests, a production of potash might be achieved more quickly and cheaply by pumping the brine solution which was proved at the base of the D'Arcy borehole.

Furthermore, it was realised that the recovery of potash by this means would involve also the separation of about 10 times the quantity of common salt, and that the economics of the project might be favourably influenced if the salt could also be used. There was also the possibility of natural gas, if it were found to exist in quantity, being utilised in connection with the pumping as a source of fuel in the extraction process, or being developed concurrently for other purposes.

Dr. A. Fleck, a director of I.C.I., later attended this meeting and his attention was drawn to the opinion the committee had reached. He admitted that up to that time I.C.I. had not thought that the extraction of potash from the deposits was a proposition which would justify commercial development by the company. After this meeting, however, I.C.I. examined the brine-pumping scheme and subsequently wrote to the committee (February, 1948) that it thought the project held sufficient promise to justify further exploratory boring; this it was prepared to undertake at its own expense.

In March, 1948, the committee communicated its provisional conclusions to the Minister, emphasising that on the face of it, the brine-pumping scheme was more attractive than mining polyhalite. The committee stated that the prospect of proving thicker beds of sylvinite must not be overlooked as this was potentially much more important.

I.C.I. Investigates

I.C.I. commenced one exploratory borehole later in 1948, with the main objective of investigating the potentialities of the potassium-bearing brine. By February, 1949, when this account was written, the borehole had been carried to a depth of 5500 ft., but it had not adequately penetrated the limestone strata in which the brine had been found in the earlier borehole, and technical limitation of the only equipment at present available prevented the borehole being carried to a greater depth. No further information about the prospects of the brine-pumping scheme, therefore, had yet been obtained.

This latest borehole, however, has yielded other information of great value. Precautions were taken to obtain cores of the strata in which the potash salts were recorded in the original borehole, and the committee understands that indications of a substantial thickness of potassium minerals were obtained which are promising enough to justify further exploratory work. Furthermore, it would appear that interest may again turn to the possibility of recovering potassium chloride either by mining or by a solution method, rather than by pumping the deeper seated potassium-bearing brine.

Though the magnitude in a geological sense and the economic importance of this latest discovery have yet to be proved, and it may be as long as two years before sufficient additional exploration has been carried out, it looks as if the prospect is emerging of a most important addition to the country's natural reserves. As this is the first indication of the occurrence of a substantial quantity of a mineral highly valuable to agriculture, the whole of our domestic requirements of which are at present imported, great significance must be attached to this information, the report states.

If the most sanguine hopes of this project are realised and it is found that sufficient potash can be produced economically to make a substantial contribution to our domestic requirements, or even to make the U.K. self-supporting in this respect, then the question of whether one firm could or should embark on an undertaking of such national importance ought to be examined, adds the committee's report. Furthermore, the development of such a project, whether or not it be undertaken by more than one firm, should be properly planned and related to information about the extent and importance of the mineral occurrence as a whole.

In the meantime, now that more specific information is available about the extent of potash deposits, it is urgently necessary that further boreholes should be sunk, in order that the extent and economic value of the occurrence can be determined and the most suitable method of development in the national interest be ascertained. Until the proposed Mineral Development Commission is set up, the national interest in a project of this importance should be secured by some form of joint company with a controlling State interest, but in which other firms who might be interested in potash production in this country should be given the opportunity of participating under suitable arrangements.

The committee also recommends that, unless its proposals regarding the establishment of a Mineral Development Commission and the nationalisation of mineral rights are to be implemented within a short time, the mineral right in specified potash-bearing minerals shall be nationalised separately, and without delay, in the same manner in which petroleum mineral rights were nationalised under the Petroleum (Production) Act, 1934.

MINING CONGRESS ENDS

THE Fourth Empire Mining and Metallurgical Congress at its final session on Saturday (July 16) acclaimed the decision of the Empire Council of Mining and Metallurgical Institutions to accept the invitation of the Australian Government to hold the next congress in Australia in 1953. The offer of the Australasian Institute of Mining and Metallurgy to organise the meetings was also cordially accepted. The New Zealand Government has offered to share in making arrangements.

In winding up the proceedings, Sir Henry Tizard, president of the congress, proposed a vote of thanks to the University of Oxford, the Mayor and Mayoress of Oxford and all those companies and corporations and organising committees of the excursion centres whose generosity and hospitality had made the congress possible. A warm vote of thanks was also extended to the Institution of Mining Engineers and the Institution of Mining and Metallurgy; and to the organising secretary of the congress, Mr. F. G. C. Cutcliffe.

TITANIUM PROSPECTS

A NEW and cheaper process for extracting titanium from ore has been announced by Canadian experts of the Dominion Magnesium Company, Ltd., Renfrew, Ontario. Government experts have estimated that the world's largest supply of titanium is in Canada, at Allard Lake, Quebec, where deposits of the ore are said to total from 150-200 million tons.

The great ore deposit is 22 miles north of Havre St. Pierre, a port on the north shore of the Gulf of St. Lawrence, 570 miles below Montreal. A railway is already under construction from Havre St. Pierre, 27 miles to the ore body.

So far, U.S. undertakings, the Kennecott Copper Company and the New Jersey Zinc Company, have invested $25 million in the new metal. Their objective is to treat 2500 tons of ore a day. This will require the construction of an electric furnace, to be built at Sorel, Quebec. A contract has been let to the Shawinigan Water and Power Company for 150,000 h.p. to be made available by 1951.

Synthetic Detergents in France

Annual Production May Soon Reach 50,000 Tons

IN the many recent articles on the relatively new detergents, American progress has figured prominently. Probably less has been heard from other countries, doubtless for the simple reason that there has been less to record. France, however, appears to be an exception.

Although, in his comprehensive review of the subject, J. P. Sisley (*Oleagineux*, July, 1949, pp.405-413) had necessarily to devote considerable space to U.S. achievements, he brings France well into the picture.

Many Varieties

Production of synthetic detergents in France is expected to reach 50,000 tons by 1952, mostly alkyl sulphates and sulphonates. This compares with over 220,000 tons produced in U.S.A. in 1947, or about one-fifth of France's soap output. Beginning with the alkyl sulphates (sulphonated fatty alcohols), there are several made and sold in France, such as Sipons (Sinnova), Primatex (Francolor), Meliorans (Beycopal), etc. They are also the base of numerous washing preparations, *e.g.*, Solilaine, Percroix, Floss-Mousse, Agnèl, Bouclaine Blanche-Neige, and so on.

The sulphonated oxyethylamides of fatty acids are well known in France and also form the base of numerous specialities, including Sodapon T, Enerpon, Galloran, Solepals, Amitex TB, etc., and in washing preparations: Catox, Lavix, Mirabelle, Monolys, Orix.

Another group of comparable importance is that of the alkyl-arylsulphonates, including those with long straight paraffinic chains, for which Valtee has proposed the name liparylsulphonates. For products of the Nekal type, or condensates of a monomeric olefin, he has suggested the designation alcoyls or polyalcoylarylsulphonates.

The mono form of the latter has specially good softening qualities in either a hot or cold medium, as well as high stability. The poly compounds have similar properties, as well as marked degreasing powers. Owing, however, to their lack of molecular orientation their detergent properties are considered poor.

These relatively complex bodies are capable of innumerable modifications in structure and properties; and Sisley thinks that, in France, the problem of selection for specific purposes should be a matter of careful study since the automatic washing machine is still very little used in France. French examples of this class or of materials containing them are Sinnopons and Sivannons NSL, Ergagnols, Texaryl DS, Arylon, PAIC Agnel, Mir, Superlavix.

Among the alkyl sulphonates, those of Etab. Kuhlmann are fairly well known under the name of Ekasol D and Ekasol H, both in liquid form. But this class, though definitely of a detergent nature, is less efficient than those mentioned above. Of the secondary alkyl sulphates, Teepol is also well known in France, and among other things, forms a base for specialities used in the treatment or washing of woollens, *e.g.*, Bain-Mousse.

In the field of non-ionic products, *i.e.*, without active ions, there are three main groups: (a) non-dispersible, (b) dispersible, and (c) soluble. They were brought to the attention of French manufacturers by Sisley in 1943, in a paper read at the Centre de Perfect. Tech. de la Maison de Chimie. Another classification besides that based on behaviour with water is:—

1. Products obtained by auto-condensation of ethylene oxide, of which Polyglycol, Carbowax, and Emka pols are examples.
2. Products obtained by condensation of oils or fats or their derivatives with ethylene oxide. Examples include: derivatives of fatty acids (Edunine ON, Cémulsol, Emulsov; of fatty alcohols (Emulphor O); of aliphatic amides (Ethomids); and of aliphatic amines (Antarox E).
3. Products obtained by condensation of oxy-alkyl-aryl compounds with ethylene oxide, as exemplified by the well known Igepals, Triton, Sipon, etc.

Popular Form

Because of the absence of active ions, these products have no affinity for textile fibres, and their properties depend on length of the aliphatic chain and on the extent of oxy-ethylation. An important French product of this class is Léonil O (oleic alcohol condensed with 20 mol. of ethylene oxide), regarded as an excellent detergent for woollens; another variant is Léonil FFO, obtained by condensation of hexyl-heptyl-beta-naphthol with 8 mol. ethylene oxide.

(*continued on page* 148)

BUYERS' MARKET FOR GERMAN CHEMICALS

Export Agreements with France, Poland, Iran and Japan

INDUSTRIAL chemicals were one of the few industries in western Germany which further increased production during the month of June. Complete statistics for the first half of 1949 are expected to show substantial advances compared with the preceding year.

In May, production of sulphuric acid amounted to 78,200 tons (SO_3) against 48,100 tons in June, 1948; phosphatic fertilisers to 25,500 tons (P_2O_5) against 12,100 tons; dyestuffs to 1219 tons against 525 tons; soap to 6010 tons against 2371 tons; and washing agents to 15,000 tons against 10,600 tons.

Of special interest in view of the controversy concerning the dismantling of coal-oil plants are the statistics for the Fischer-Tropsch plants. These produced 4879 tons of primary products in May, 1775 tons of synthetic petrol, 573 tons of paraffin "gatsch," and 133 tons of hard paraffin.

Several more of the trade agreements which expired at the middle of this year have been extended for a period of 12 months, including those with France and Denmark. Chemicals are figuring prominently among the goods which western Germany has undertaken to supply. An agreement concluded with Poland provides for exports of $4.6 million worth of chemicals from western Germany. Finland is to receive $800,000 worth of west German chemicals and colours, Portugal $1.5 million worth of chemical and allied products, and Iran $1.8 worth of chemicals, paints, etc. Paints, dyes, and chemical fertilisers also account for a substantial part of the $10 million allocation of goods for Japan.

Russian Aims

The trade negotiations with the Soviet occupation zone of Germany are making very slow progress, and an agreement is by no means certain yet, but the Soviet zone authorities have stated that they wish to spend Dm.12 million on chemical products from western Germany. The eastern zone has at the same time presented a list of goods which are available for dispatch to the West, including chemical products amounting to Dm.5.85 million.

The renewal of trade agreements, in some cases providing for greatly increased shipments, has been noted with considerable interest by German chemical manufacturers, because marketing difficulties have arisen in several sectors of the industry during recent months. While seasonal factors may be largely responsible for the fact that a substantial part of the nitrogen fertiliser production—up to 60 per cent—has to be put into store, this explanation cannot be offered for the slow sale of soda ash and caustic soda. already reflected in declining outputs.

The decline in alcohol production during May is attributed to the high prices, which are said to have adversely affected the export prospects for organic products made from alcohol. Dyestuffs makers also report marketing difficulties, but sales of pharmaceutical preparations are said to exceed the level usual at this time of the year.

Soap Industry Problems

The German authorities have been urging the abolition of soap rationing on the grounds that the production of soap and detergents has lately been increasing rapidly and actual demand can at present be satisfied completely. Largely as a result of high prices, however, consumption has fallen substantially below pre-war levels and the standard in comparable European countries. As the most recent purchases of vegetable oils were made at lower prices, price reductions are expected, and consumption may be expected to improve.

It is still argued, however, that dismantling of all Fischer-Tropsch plants would deprive the soap industry of a useful source of raw materials, especially for washing powders, which would increase the demand for natural fatty acids by 40,000 tons a year. During the second half of 1949 between 24,000 and 28,000 tons of fatty acid are to be made available for the manufacture of soap, including 18,000 tons from imports. Better supplies of essential oils and other soap-making materials are also expected.

The Dortmund Chamber of Industry and Commerce has drawn up a memorandum on the dismantling of Fischer-Tropsch plants in which arguments used earlier are repeated. It is claimed that these plants would prove of particular advantage if and when sales of coal declined. The Fischer-Tropsch plants could use inferior coke which was not suitable for metallurgical purposes.

The products obtained had three and

a quarter times the value of the coke and gas used, and the plants could therefore help to raise the potential profits of the coal mining industry, while at the same time ensuring additional employment for the Ruhr region.

In the aluminium industry dismantling operations began last week in the Erftwerk Grevenbroich, and the aluminium works at Töging, Bavaria, have received an order for partial dismantling. Both plants are owned by Vereinigte Aluminium-Werke, AG, whose combined output capacity exceeds the 85,000 tons a year maximum allowed to the western zones. German quarters, however, argue that after the dismantling at Grevenbroich and Töging the permitted maximum output will not be attainable, and that in any case 85,000 tons a year is less than the requirements of the western zones.

Pharmacy Exports

The well-known Schering pharmaceutical factory in Berlin has been forced to dismiss 250 of 1600 employees and to introduce a 36 hour-week as a " rationalisation " measure. Some of the departments moved to western Germany before the end of the war are now to be brought back to Berlin, but manufacturing activities will continue in a branch factory at Brunswick-Wolfenbuettel. The export business is described as satisfactory, especially to Turkey and Egypt, and also to Switzerland, Spain, Portugal and Siam.

Bakelite, GmbH, has opened production facilities in the works of Chemische Fabrik Weyl at Munich-Pasing to make up for the loss of its works in the Soviet zone and is once again producing phenolic resins for the paper and fibre-board industries. It is also making lacquer materials, resins for the manufacture of brushes, and raw materials for the plastics industry.

Ruhr Dismantling

DISMANTLING of further synthetic oil plant was scheduled to begin in the Ruhr this week.

The machinery to be removed is not in production and forms part of the plant of the Merbeck chemical works of the Rheinpreussen mining company at Moers, near Duisburg.

Coke ovens and machinery for producing a number of chemical by-products will not be affected, and the maintenance staff, who numbered about 100, are expected to be found other employment.

ITALIAN STEEL INDUSTRY

Modernisation under ECA

FIVE projects to modernise the Italian iron and steel industry, involving $9 million in ECA assistance funds, as part of Italy's four-year programme have been approved by the ECA in Washington. Most of the equipment for modernising Italian plants will be purchased in the U.S.A. It is indicated that a production level in the iron and steel industry equivalent to 2.5 million tons of crude steel per year is a rational basis for current planning.

The projects approved in Washington were:—

1. Equipment for modernisation of steel works of Acciaierie e Ferriere Lombardy Falck at Milan—$2.2 million in ECA funds and 1.7 billion lire.
2. Cold rolling mill for tin plate for Cantieri Metallurgici Italiani at Castellammare di Stabia—$1.96 million in ECA funds and 287.5 million lire.
3. Slab and billet mill for special steels for Cogne SPA in the Aosta Valley—$1.03 million in ECA funds and 273 million lire.
4. Continuous wire rod mill and bolt and nut equipment for SISMA at Villadesse—$2.45 million in ECA funds and 1.6 billion lire.
5. Slab and billet mill for I.L.S.S.A.—Viola at Pont St. Martin, Aosta Valley—$1.46 million in ECA funds and 800 million lire.

SYNTHETIC DETERGENTS IN FRANCE

(*Continued from page 146*)

This class of product, first prepared in Germany in 1932, is now made in France, England, America, and Belgium. The author has noted no less than 150 trade names belonging to 35 different firms. Production in the U.S.A. in 1946 was 900 tons, but this output is now exceeded by one firm alone. A limiting factor appears to be provision of ethylene oxide.

The author devotes most of the remainder of his review to the action of detergents, including synergic effects, with particular reference to recent American work in this field.

He has for many years urged upon the French chemical industry the importance of synthetic detergents and related products, emphasising at the same time that they are not merely soap substitutes. The French manufacturers are advised to exercise scrupulous care and chemical control in selection or production of raw materials, and to maintain quality.

NEW USES OF LEVULINIC ACID

Sugar Derivative as a Plastics Material

From A SPECIAL CORRESPONDENT

IN its search for new raw materials the plastics industry is showing an increasing interest in levulinic acid, which is now being manufactured in commercial quantities from sugar. This ketone acid is a crystalline solid; its specific gravity is 1.140 (20° C.); melting point 33.5° C.; boiling point 246° C., and it dissolves readily in water, alcohol or ether.

Levulinic acid forms salts and esters normally, its esters being of particular interest for use as plasticisers and solvents, *e.g.*, the methyl isopropyl, isoamyl and methyl propyl carbinol esters.

Many laboratory methods are available for the synthesis of levulinic acid, the simplest being to heat a hexose sugar, or a carbohydrate capable of being hydrolysed to a hexose sugar, in an aqueous solution with a mineral acid. Thus from sucrose, dextrose and levulose the catalytic action of dilute sulphuric and hydrochloric brings about the following change:

$$C_5H_{12}O_6 \rightarrow CH_3COCH_2CH_2CO_2H + CO + H_2O$$

Hydrobromic acid is much more effective as a catalyst than either hydrochloric or sulphuric acid and 10 per cent hydrobromic acid, when heated for 24 hours at 130° C. with dry glucose, will give a yield of 75.3 per cent of the theoretical amount of levulinic acid. In 1944 a British patent taken out by Haworth J. Wiggins (No. 583,533), disclosed that in the preparation of levulinic acid from sucrose a low concentration of sodium bromide could be used with hydrochloric acid to replace the expensive hydrobromic acid, and that by increasing the temperature and reducing the strength of the sucrose solution a considerable increase in the yield of levulinic acid could be obtained.

Research on Derivatives

A great deal of work on the derivatives of levulinic acid was carried out in America in 1930-33 under a multiple fellowship of the Sugar Institute, Inc., and the Mellon Institute of Industrial Research. The alkyl esters described by G. J. Cox and M. L. Dodds (*J. Amer. Chem. Soc.*, *55*, 3391 (1933) and *Ind. Eng. Chem.* *25*, 967 (1933)) are of considerable interest on account of their mutual solubility with water, stability of the esters in water, solubility of gums and resins in the esters and their miscibility with organic solvents.

The butyl and amyl esters appear to be the most immediately useful of the alkyl esters and, when these become available in commercial quantities, it is expected that they will find their most important outlets in the manufacture of resin-based lacquers for coating purposes.

Plasticisers prepared from levulinic acid are claimed to be effective for thermoplastic resins and synthetic rubber. The Dow Chemical Company took out a patent in 1944 (U.S. Pat. 2,359,622) for the esterification of a bisphenol to form 2, 2-bis (4=β−levulinyloxyethoxphenyl) propane, which offers promise as a plasticiser.

Plasticiser Characteristics

The Resinous Products and Chemical Company (U.S. Pat. 2,395,452) disclosed the preparation of the levulinate of hydroxy - dehydronordi - cyclopentadiene which is claimed to possess useful plasticiser characteristics; and Commercial Solvents Corporation (U.S. Pat. 2,406,504) has published a method of preparing Cyclic Ketol Compounds by treating an alkyl levulinate with 2-nitro-1,3-propanediol in the presence of an acid catalyst. The Pittsburg Plate Glass Company (U.S. Pat. 2,407,413) has patented the use of methyl levulinate as a plasticiser for styrene-maleic anhydride resin and claims that it possesses outstanding merit.

Although initial experiments in the production of levulinic plastics have not been entirely successful (the Hawaiian Sugar Planters' Association reported adversely on such resins as compared with commercial synthetic resins), there is evidence that derivatives of levulinic acid may be of importance in certain specialised fields. In a du Pont patent (U.S. Pat. 2,191,897, 1940) a water soluble levulinic acid addition product of ethanolamine is described as a softener for a flexible durable sensitive cellulosic structure. The Wingfoot Corporation (British Pat. 569,407, 1945) has discovered a method of making a levulinic plastic by co-polymerising a compound, such as dichloroallyl levulinate with a conjugated butadiene. The result is a thermoplastic possessing some interesting properties.

STUDYING SURFACE TEXTURES

Simple Plastic Reproductions and Light Tests

DEVELOPING a replica procedure originated for tests of machined metal, J. C. Richmond, of the Enamelled Metals Laboratory, and A. C. Francisco, research associate of the Porclain Enamel Institute, at the U.S. Bureau of Standards, have developed a plastic-replica technique by which the texture of porcelain enamel may be conveniently studied and compared.

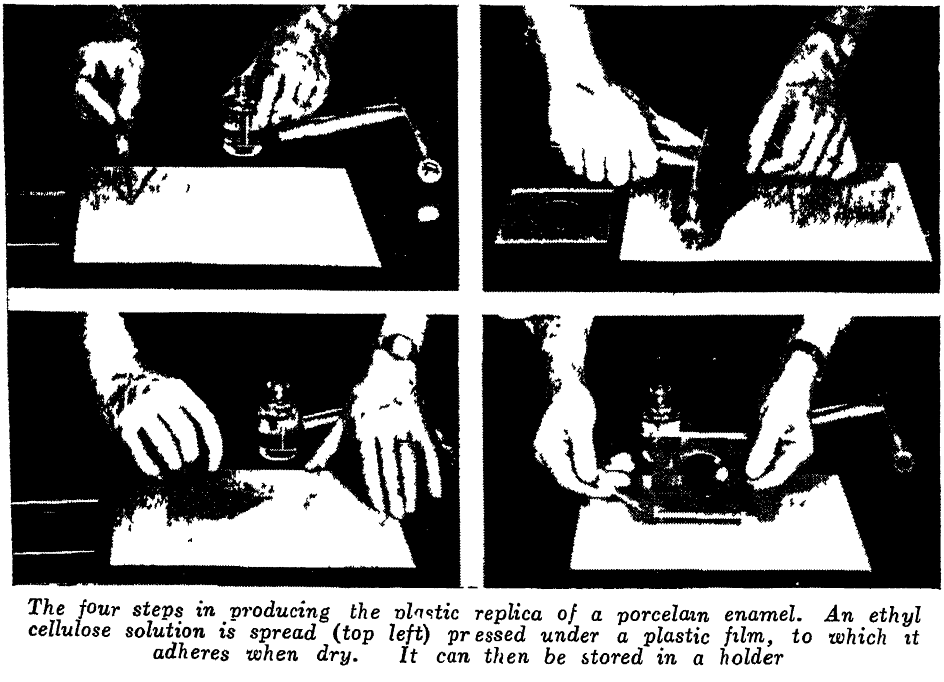
Evaluation is based on the measurement of the haze of an ethyl cellulose replica of the enamel. Such replicas may be readily examined by transmitted or reflected light, or can be projected for examination of the enlarged image. Details seen only with difficulty in the original surface are readily visible in the replica, which is a true reproduction of the surface texture.

Another advantage of the new method is that the replica forms a permanent record for reference. By making a series of replicas during an endurance test an investigator may follow the progressive breakdown of an enamel or metal surface.

Measurement of surface texture would aid in gauging surface defects as they occur in the plant. Moreover, a simple quantitative method for measuring this property of enamels should find wide use not only in the plant, but also in the laboratory and in field tests.

Laboratory tests for resistance to abrasion and attack by acids or alkalis are usually designed to reproduce under controlled conditions the mechanisms that damage the enamel in service. Therefore, quantitative measurements of surface texture should be valuable for evaluating and correlating the results of laboratory tests with performance in service.

Plastic replicas of porcelain enamel surfaces are prepared by a procedure similar to that used for replicas of machined metal surfaces. A solution is prepared by dissolving 1 g. of ethyl cellulose in 100 ml. of a solvent composed of 80 parts toluene to 20 parts acetone, by volume. A small amount of this solution is placed near one edge of the test area and is spread and pressed on the surface of the specimen under a 4-in. square sheet of ethyl cellulose (0.0075 in. thick) with a rubber roller.



The four steps in producing the plastic replica of a porcelain enamel. An ethyl cellulose solution is spread (top left) pressed under a plastic film, to which it adheres when dry. It can then be stored in a holder

After drying for a few minutes, the replica can be easily stripped from the surface. There is a tendency for it to curl on further drying, so that it is usually placed in a metal holder immediately after stripping.

As a part of the bureau's investigation, specimens of 25 enamels, submitted by the Porcelain Enamel Institute as representing a wide range of abrasion resistance, were given the standard (1942) PEI surface abrasion test. This test is based on the measurement of the loss in 45° specular gloss of the specimens produced by a standard surface abrasion treatment. Replicas from the abraded specimens were then rated by means of haze measurements, that is, the amount of light diffusely transmitted by a specimen, expressed as a percentage of the total transmission.

Close Agreement

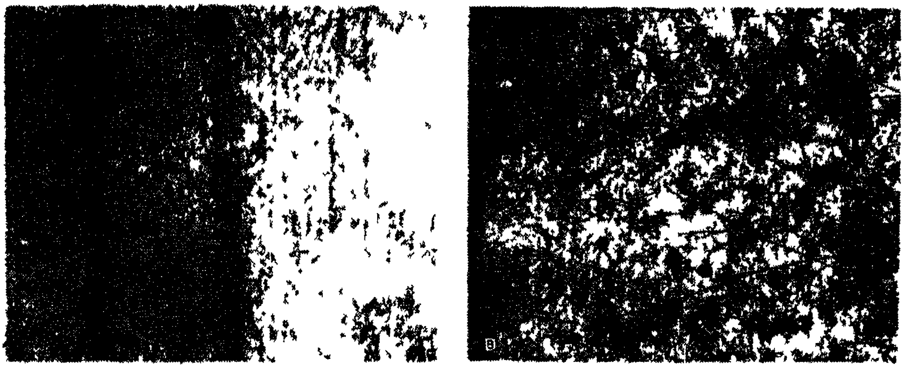
Comparison of the different methods of rating 25 enamels revealed that there was excellent agreement between the ratings of replicas as obtained by visual estimates and by haze measurements. Ratings of the specimens by the PEI loss-of-gloss method agreed fairly well with ratings by visual estimates made on the specimens and with haze measurements made on replicas, taken from the specimens.

Perfect agreement would not be expected in these cases, since different but related properties are being evaluated. Poorer agreement was obtained between ratings by haze measurements on replicas and by visual estimates on the various specimens.

Computing irregularities in the replica in haze meter, based on two readings of light transmission

The replica technique should find application wherever small-scale surface roughness is evaluated. It can be used to classify surfaces as mat, semi-mat or glossy, or to evaluate the degree of roughness developed in application of the enamel.

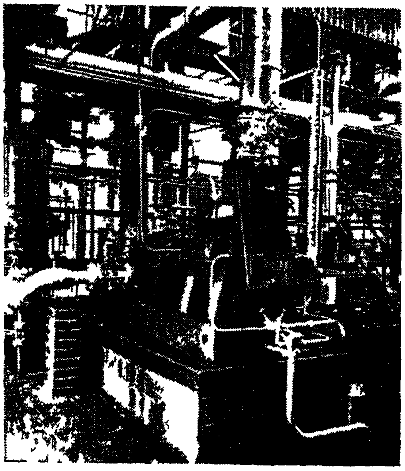
Replicas made in the field can be examined by the investigator at his convenience, or sent to a central laboratory for study. A series of replicas of the same area of a test item, made before installation and after successive periods of service, will permit a study of the progressive breakdown of a surface.



Two characteristic replicas showing (left) wear effect, principally on the peaks of a corrugated enamel surface, and (right) the widely distributed damage sustained by an "orange peeled" plain enamel

PUMPS FOR THE NEW OIL REFINERIES

Some of the Chemical Engineering Problems



One of the reactor pumps at Stanlow handling a mixture of hydrocarbon and acid

PROMINENT among the chemical engineering problems involved in the huge oil refinery and chemicals-from-oil plants now being constructed or put into operation in several parts of the country, is the installation of pumps. The circulating of the chemical liquids, required in the new plant of the Shell Chemical Manufacturing Co., Ltd., at Stanlow, near Ellesmere Port (THE CHEMICAL AGE, *61*, 45-47), from one section to another, and through stills, tanks, columns and heat exchangers, has called for a great variety of pumping equipment, some of special design.

These consist of well over 250 centrifugal pumps, covering the majority of all pumping conditions in the new plant, and are by Sigmund Pumps, Ltd., which has been responsible for this equipment. It is stated that some of the liquids are extremely volatile, others toxic; many are pumped at high temperatures (some above 600°F.); and again some are expensive, costing in some cases over 10s. per gallon. All kinds of liquids, from propanes and butanes to viscose fuels, have to be dealt with. These conditions demand extreme reliability of the pumps throughout, but especially of the shaft sealing member, in order to reduce leakage to an absolute minimum.

The large number of pumps involved created a considerable maintenance problem, as it seemed quite out of proportion to have a spare pump available for each duty, as is often done in refineries. To deal with all these aspects, all the duties to be performed were tabulated and then grouped. Thus, three basic pump designs were selected: a single-stage pump, a two-stage pump and a multi-stage barrel pump. Within these groups steps were taken to keep variations of parts to a minimum by employing the same internal parts in all three groups, *i.e.*, all employing the same impellers and wear rings, and between single and two-stage pumps only one bearing assembly is used.

Thus, about half of the total number of pumps supplied use the same wear rings, shaft sleeves and other wearing parts in single, two-stage and multi-stage units, and even in some vertical sump pumps. There are only two sizes of impellers used in these pumps, differing only in width, thus leaving all other components similar. A second batch of about 80 pumps uses another size of impeller and relevant components, one bearing assembly only being used for this group.

Facilitating Maintenance

Over three-quarters of all the pumps have only two sizes of bearing assemblies in single and two-stage pumps, the inevitable problems of maintenance during operation being much facilitated by this method and the work of storekeeping reduced to a few items only, which not only simplifies maintenance but also reduces considerably the outlay for spare parts.

Most of the pumps employ diffusers in either a ring casing or a volute casing. This has, in the case of ring casings, simplified the positioning of pump branches, the intakes being either horizontal, left or right, with outlets opposite, or top-top in an otherwise similar casing and similar direction of rotation.

Apart from this consideration, however, diffusers were chosen for another important reason. As is well known, simple volute type pumps have a heavy radial thrust, set up by pressure conditions in the volute against the shaft. This tends not only to deflect the shaft in one direction, but also to create various states of deflection and vibration when controlling pump outputs during operation, which is done automatically by appropriate instrumentation.

The result of this unsteadiness of the shafts is quick wear of packings and shaft sleeves and difficulty in controlling leakage. Diffusers eliminate largely any radial thrust against the shaft and thus tend to reduce leakage to an unavoidable minimum. A leakage of one gallon per hour, when the price of the liquid is 10s. per gallon, would constitute a loss of £12 per day, a loss which is in almost all cases total, because most of the liquids evaporate on getting into the atmosphere. Provision is made for inserting Sigmund mechanical seals without any further modification, and after first using soft packing with appropriate and, in some cases, rather elaborate sealing systems, mechanical seals are now being installed for the more onerous duties.

Useful Design Feature

As a further means of reducing gland leakage, all stuffing boxes are kept under suction pressure only, this being accomplished by having the pump intake at the stuffing box end. This design feature has the further advantage of washing solids, such as crystals or grit, away from the stuffing box, instead of against it, as is the case with the more orthodox pump design. A cooling chamber surrounding the suction improves suction flow conditions on volatile and/or hot liquids.

A reactor pump deals with an onerous sludge consisting of light hydrocarbon and acid. The suction inlet at the stuffing box end is a typical feature of this. A special sealing system was thought necessary with injection and throttle clearances, to keep the amount of sealing liquid used to a minimum.

Internal Bearings

The liquid used for sealing is concentrated sulphuric acid, and stuffing box parts, as well as bedplates, are lead lined. Due to the length of the overhung shaft portion thus required, it was found necessary to incorporate an internal bearing. This could be done in this instance because the acid pumped, though extremely corrosive, is a good lubricant. Special materials are used throughout for this pump and the shaft-protecting sleeves and bearing bushes are faced with Colmonoy No. 6, an extremely hard and corrosion-resisting material.

For a considerable number of duties, where light hydrocarbons are pumped at high temperatures and pressures, barrel pumps were supplied with from three to eight stages. In these, only two joints are used, one of which is under high pressure, so that the danger of leakages from a multitude of vertical casing joints is reduced to a minimum.

A battery of centrifugal pumps, of which more than 250 are required for lifting and circulating the varied liquid materials employed by the processes at Stanlow

Growing Chemical Yield from Petroleum

Scope of U.S. Expansion Described at French Congress

A WIDE-RANGING survey of the recent advances and prospects for the use of petroleum as a raw material of the chemical industry was the principal item in the programme of the Association of French Petroleum Technicians —AFTP—during its traditional "Technical Week," which was held in Paris recently, the fourth of its kind since its inauguration in 1938.

A number of summaries of the many informative addresses delivered by leading authorities in their various spheres at this meeting have been reproduced this month by the *Petroleum Press Service.*

Chemical Derivatives

The phenomenal growth of the output of chemicals from petroleum in the U.S.A. was illustrated by some striking statistics submitted by Mr. E. V. Murphree (president of the Standard Oil Development Company), who dwelt mainly upon synthetic rubbers, plastics and fibres.

U.S. production of organic chemicals from petroleum or natural gas has risen from less than 100 tons in 1925, to a rate approaching 2 million tons a year. This compares with 1.5 million tons in 1945, the last year of the war. The combined output of formaldehyde, acetic anhydride, styrene, phenol and phthalic anhydride—all derived from hydrocarbons—amounted to 1 million tons in 1948, compared with 200,000 tons 10 years ago.

Synthetic rubber, the large scale production of which dates from the war, has obviously come to stay in the U.S.A., where more than 400,000 tons were used last year, compared with a natural rubber consumption of slightly over 600,000 tons. The great bulk of the U.S. synthetic rubber output consists of Buna-S, but the annual demand figure also includes about 60,000 tons of butyl rubber, 33,000 tons of Neoprene, and 6000 tons of Buna-A.

A large proportion of the supply of plastics and resins, which has jumped from 100,000 tons in 1939 to 660,000 tons in 1948, is now derived from vinyls and polystyrene, instead of the cellulose used almost exclusively 10 years ago.

America's production of rayon last year was approximately 500,000 tons, of which, however, only about one-third consisted of truly synthetic materials. This portion was obtained from cellulose and acetic anhydride, the latter having been derived chiefly from petroleum.

Other synthetic fibres, including, in particular, nylon, amounted last year to less than 10 per cent of the volume of rayon produced in the U.S.A., but some of these can be expected in future to play an increasingly important part in the textile field, said Mr. Murphree.

The production of synthetic detergents in the U.S.A. was discussed by Mr H. E. Bramston-Cook, general manager, Oronite Chemical Co. (Standard Oil of California), who showed what a considerable rôle these are already playing in U.S. consumption and how rapidly their use is increasing. He disclosed that U.S. sales of soap had dropped from 791 million lb. during the fourth quarter of 1947 to 515 million lb. in the corresponding three months of 1948, but that sales of package detergents had risen in 1948 from 60 million lb. in the first quarter to 120 million lb. in the last quarter. Industrial uses of synthetic detergents, not included in these figures, were, he said, estimated at 200 million lb. in 1948.

Biological Applications

The subject of the biological application of petroleum products was dealt with by Mr. G. H. Visser, director of research, Royal Dutch Shell Laboratory, Amsterdam. Certain petroleum fractions and petroleum-based chemicals, he said, were capable of exerting a pronounced influence on the physiological functions of some animals and plants.

Scottish Interest in U.S. Industries

WITH the object of extending Scotland's range of industries, particularly those based in scientific discovery, Sir Steven Bilsland, chairman of the Scottish Council (Development and Industry), and Dr. Christopher Macrae, secretary, will devote part of their visit to the United States in October to American firms who might be persuaded to establish plant in this country.

The council is examining, in association with British firms, the possibility of development in various branches of the chemical industry. The chemicals sub-committee has appointed a small group of experts to assess the needs of the plastics industry.

ADVANCED AMERICAN INSTRUMENTS

A Review of Some Recent Developments

From OUR NEW YORK CORRESPONDENT

A WIDE variety of new laboratory instruments has been developed and announced in the U.S.A. during recent months. These range from new instruments to detect atomic energy radiations to a new vacuum-tube voltmeter for measuring voltage in electronic and other low-energy circuits.

Research workers who perform calorimetric measurements at extremely low temperatures, in the region of 10° K and higher, now have at their disposal a new thimble-size platinum resistance thermometer for precise temperature detection, introduced by Leeds and Northrup Company, Philadelphia, Pa. Although only about one-eighth the size of standard high-precision platinum thermometers, it uses the same temperature-sensitive element.

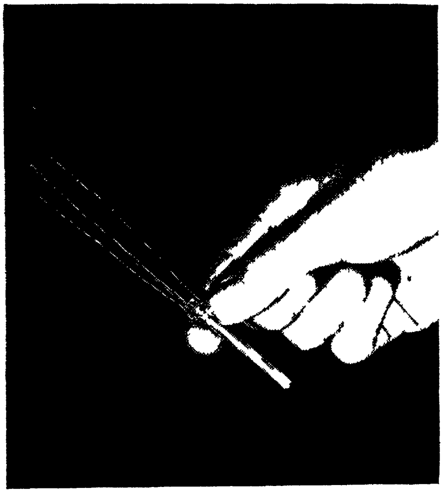
The thermometer has a platinum protecting tube, about 48 mm. long and a 5.6 mm. outside diameter, and can be readily mounted entirely inside a calorimeter by casting in low-melting alloy. It is helium-filled, and therefore usable down to approximately the boiling point of helium, about 5° K. Four-wire current and potential leads are brought out through a glass seal. Nominal resistance at 0° C. is 25.5 ohms.

Resistance Thermometry

The instrument can also be employed as a primary standard for resistance thermometry between -190 and $+500$°C. When used with the type 2-G Mueller bridge, temperature measurements can be made to an accuracy of + or − 0.01°C.

For studying the tiny, high speed particles that constitute beta-rays, scientists require instruments that combine precision with great facility of operation. These are some of the features which Leeds and Northrup Company says have been incorporated in the latest model of its type K potentiometer, known as the K-2. Chief features of this are the addition of a third and lower range, elimination of exposed electric conducting parts, and standardisation of the instrument on any of its three ranges (0 to 0.0161, 0 to 0.161, and 0 to 1.61 volt).

A convenient instrument to use, the last one-tenth, one-hundredth, or one-thousandth volt is spread over a 5-meter slidewire, making it a simple matter to follow a small fluctuating voltage with ease and accuracy not ordinarily possible where several switches must be manipulated within the range of the fluctuations.



Low temperature platinum resistance thermometer

The potentiometer may be used for various measurements of potential difference, for measurement of hydrogen-ion concentration, oxidation/reduction, polarisation and contact potentials. In research and industrial laboratories it is used for measurements of temperature and *p*H, and other potential measurements.

Recent investigations at the U.S. National Bureau of Standards of the effect of mechanical working on the physical properties of lubricating greases have led to the development of an apparatus for working the grease and measuring its flow characteristics in the same series of operations. Principal advantages of the apparatus are its flexibility, wide range of shear and consistency measurements, short test cycle, simplicity of design, and, provision for characteristic flow data while working under controlled conditions.

In addition to the application to greases, the apparatus has been used to determine the apparent viscosity of rubber solutions at different rates of shear and temperature. The worker consistometer is composed essentially of two coaxial

Apparatus for humidity regulating at temperatures below freezing point

steel cylinders mounted vertically, with a capillary-type shearing element between.

Close-fitting pistons force the grease under test through the shearing element in either direction from one cylinder to the other. While making flow measurements, dead weights are used on the down-stroke of the pistons and air pressure on the up-stroke. Provision is also made for automatic mechanical working. Possible rates of shear cover a rather wide range, from about 10 to 100,000 reciprocal seconds.

Besides its chief advantage of providing flow characteristics as the grease is being worked, the consistometer permits a complete test series at constant temperature. High rates of shear are provided by the small diameter capillary, while multi-hole discs give sufficient flexibility to cover wide ranges of rates and shear consistency. The small sample required in making a test shortens the time necessary to bring the grease to the test temperature. Simplicity of design gives facility in cleaning and charging which is significantly time saving.

New humidity test apparatus developed in the Bureau's mechanical instruments laboratory now provides workers with an instrument for research, calibration, and testing of hygrometers at temperatures below freezing. The function of the humidity test apparatus is to produce air of known relative humidity at temperatures from 0° to minus 40° C. In the new divided flow, low temperature test equipment, which was developed by Mr. Arnold Wexler, a current of dry air is divided into two streams, one of which is maintained dry, while the other is saturated with respect to ice; finally the two are recombined.

A proportioning valve is used to divide the flow of moisture-free air in a known ratio. One part is passed through a saturator over a series of trays containing ice, until it is completely saturated. It is then mixed in a mixing chamber with the other part, which has been maintained dry, and is allowed to escape through a test chamber into the atmosphere.

The saturator, mixing chamber, and test chamber are kept immersed in a constant temperature bath. The hygrometer, psychrometer, or other device, which is being subjected to air of known and constant humidity, is inserted into the test chamber. Essential functional units of the apparatus are the drying system, the proportioning system, the humidifying system, the test chamber, the cooling system, and the thermo-regulating system for temperature control.

In addition to filling a basic need in meteorology, the instrument is expected to find application in the refrigeration, air conditioning, and other fields in which humidity plays an important rôle. With the new apparatus, it is now possible to calibrate readily and accurately the various humidity instruments employed at low temperatures.

An Urgent Need

Answering the urgent need, which was particularly acute during the war, for standard samples of hydrocarbons of high purity for the calibration of spectrometers—used by the industry in the analysis of mixtures of hydrocarbons involved in the production of military aviation fuel, synthetic rubber, etc.—the National bureau of Standards has long been engaged in a programme preparing such samples and has devised special equipment to facilitate its work.

The purity of the various fractions of a hydrocarbon in preparation, as well as the final test lots, are determined from measurements of freezing points made with a precision apparatus involving a platinum resistance thermometer and bridge. The procedure utilises time-temperature observations of the liquid-solid equilibrium in freezing and melting experiments.

One of the most powerful tools for evaluation of the purity of chemical compounds is measurement of the freezing point. Two isomeric hydrocarbons having the same melting point, density, or refractive index can be mixed without significant changes in these properties. But, if two isomeric hydrocarbons having the same freezing point are mixed, the change in freezing point will usually be very large.

Accurate measurements of the freezing points are made with special apparatus utilising time-temperature freezing and melting curves. About 5 ml. of the sample to be examined are placed in an inner vacuum flask surrounded by the refrigerant and stirred by an overhead electric motor. Observations of time and temperature are made, starting with the temperature of the liquid above the freezing point and continuing until stirring becomes difficult.

By plotting these values, using a suitable scale on the temperature axis, it is possible to determine graphically the "zero time" at which crystallisation would have begun in the absence of undercooling. The corresponding temperature value is then the true freezing point.

The calculation of purity is made from the measured freezing point as well as the value of the freezing point for zero impurity and the cryoscopic (freezing) constants. Some substances, such as ethylbenzene, do not normally yield equilibrium time-temperature freezing curves.

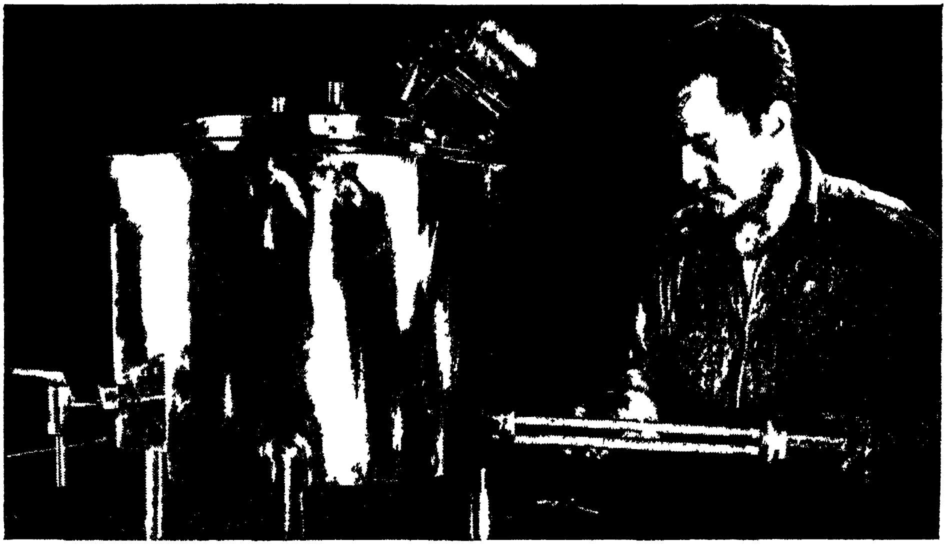
For these compounds, the determination of the freezing point is made from melting curves. In general, the procedure is the same as that for freezing experiments except that, when stirring becomes dfficult, the cooling bath is replaced by an appropriate warming bath.

The purifications are usually accomplished by a series of two, three, or four distillations, regular or azeotropic, at high efficiency and high reflux ratio. The blending of distillate for subsequent distillation, as well as for the final product, is normally done on the basis of the purity determined by measurement of freezing points.

Recognised as a superior means of heating liquids, permitting greater utilisation of heat generated with a minimum loss of heat, electric immersion heaters are coming into increasing use in industrial applications. In immersion heating the heat source is placed directly in the material to be heated, making liquid-heating operations more efficient and working conditions cooler and cleaner.

The most common type of immersion heater now in use consists of a helical coil of high-resistance wire stretched and centred in a seamless metal tubing insulated from the tube by an insulating material, such as magnesium-oxide powder, compressed to rock-like hardness. Protection against accidental contact of the heater terminals with liquids is provided by having the ends of the heater tightly sealed.

Similar precautions are taken against carbonaceous or chemical fumes by the



Good design is shown in this American version of the thermostatically controlled immersion heated reaction vessel use of silicone or mycalex seals. Among the applications for which immersion heaters have been used are water, oil, electroplating baths, cleaning compounds, chemical baths, etc. These liquids can be circulating or non-circulating, and can be in open containers, closed or pressure vessels, kettles, or steam generators. Heavy, viscous liquids such as pitch, molasses, and asphalt can be heated in the same way by using a liquid jacket containing immersion heaters.

To meet the needs of the atomic energy industry, a wide variety of instruments has been developed. Not least in importance are the new miniature radiation detection instruments, small enough to be worn on the belt or carried in a pocket, and designed to protect workers handling highly radioactive materials.

Atomic Energy Protection

Two of the new instruments designed to protect atomic energy workers are "The Pocket Screamer," which rings an alarm similar to that of an alarm clock when the worker has exceeded his daily radiation tolerance, and " The Gamma Pocket Audio Detector," which registers the presence of gamma radiation (X-rays) by a buzzing sound in an ear-plug like that worn with an ordinary hearing aid.

Expected to find wide application for adjusting and testing equipment used for heating, ventilating and air conditioning, a new three-way air meter, called the " Anemotherm," providing air velocity, air temperature and static pressure readings at the turn of a knob, has recently been developed by the Anemostat Corporation of America, New York. Operating on self-contained batteries, the new instrument, weighing only 11 lb., is portable, and the small probe, attached to a long flexible cable, permits the taking of readings anywhere, even in the neck of an air diffuser.

The new meter measures air velocity in a wider range than hitherto possible, from 10 fpm to 5000 fpm, and provides rapid-response measurement of temperatures from 30°F. to 155°F. Either negative or positive static pressure may be read directly in inches of water, from .05 to 10 positive, and .05 to 4 negative. The new instrument detects even the slightest draughts and measures air velocity accurately regardless of direction of air flow.

Capable of measuring the amount of light from a candle five miles distant, a photo-electric recording Raman spectrograph, one of the few in commercial use, has been put to use analysing petroleum products in the research section of the laboratories of the Standard Oil Development Company, the research affiliate of the Standard Oil Company (New Jersey), at Linden, N.J.

Designed and constructed by chemists and engineers of the Esso Laboratories, in co-operation with instrument companies and university laboratories, the instrument is based on discoveries first made in 1928 by Sir Chandra Sekhara Raman, the Hindu physicist and Nobel Prize winner. The Raman spectrometer measures light scattered by the molecules in petroleum products, amplifies the light signal and records the analysis.

U.S. SYNTHETIC FUELS

Importance of By-Product Chemicals

THE possibility that by-product chemicals obtained in producing liquid fuels from coal may become one of the more important sources of basic ingredients for the manufacture of plastics, resins, lacquers, pharmaceuticals, solvents and explosives, is cited in a new report just released by the U.S. Bureau of Mines.

Although the primary objective in the use of the Bergius (hydrogenation of coal) and Fischer-Tropsch (gas synthesis) processes in the United States will be the conversion of coal into liquid fuels to insure an adequate supply of oil and petroleum, the report, reviewing work done so far, recognises that both the primary yield and by-products are rich sources of organic chemicals.

Cellulose Plastics

Among the by-products of the Fischer-Tropsch synthesis are water-soluble organic chemicals for cellulose plastics and fibres, acetate rayon, pharmaceutical and aliphatic industries, as well as wax and alcohols. From the Bergius process, plastics and tar bases for pharmaceuticals may be obtained, in addition to benzene, toluene and xylene for explosives and solvents. These, and other by-products, according to the report, " will be available in sufficiently large quantities to have a tremendous economic effect upon established sources and uses,"—when commercial synthetic fuel plants are operating.

The publication describes the Fischer-Tropsch and related processes and discusses primary and secondary products and their uses. It also reviews the Bureau of Mines work on the hydrogenation of typical U.S. coals, including a description of assay procedure, and summarises the results obtained during the hydrogenation of Pittsburgh-seam (Bruceton) coal under various conditions in Bureau of Mines pilot plants.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

CLAIMING that monopoly and restraint of trade in the vanadium industry was responsible for driving it out of business, the Continental Ore Company in a civil damage suit filed in the U.S. District Court, San Francisco, California, is seeking treble damages—$1,584,000—from the Union Carbide and Carbon Corporation, its subsidiaries and the Vanadium Corporation of America. The Continental Ore Company, alleging that the defendants now control 95 per cent of crude ore deposits and 100 per cent of distribution of ferro-vanadium, is also seeking a court order to break up the alleged " combination and conspiracy " on the ground that they represent a violation of the Sherman Anti-Trust Act. The complaint claims that the defendants refuse to sell vanadium oxide to other producers; entered into annual requirement contracts with purchasers to preclude others from securing the business; deprived other producers of a competitive market; apportioned and divided the sales of ferro-vanadium and vanadium oxide; assisted each other in controlling and dominating sales; and fixed identical prices for the sale of ferro-vanadium and vanadium oxide and for the purchase of vanadium bearing ore. The plaintiffs say they were obliged to leave the vanadium business in 1944.

* * *

Regarded as a retaliatory move against the U.S. ban on shipment of " war potential " goods to Russia, the U.S.S.R. has withheld manganese and chrome shipments to the U.S.A. in May for the second consecutive month. Both metals, essential for the production of high-grade steel, are considered so vital that the U.S. Government is buying them for stockpiling purposes. Meanwhile, it is reported that 300 tons of chrome from a new chrome mine located in the Sori area, Turkey, which may yield 40,000 tons this year, are being moved daily for shipment to the U.S.A. The new Turkish mine is said to be the richest in the world.

* * *

At June 30, this year, E. I. Du Pont de Nemours & Co., Inc., was owned by 99,663 separate stockholders, an increase of 2224 over the number reported at the end of the first quarter of the year, and 5419 more than on June 30, 1948. These significant facts are now being made known by Mr. Crawford H. Greenewalt, the company's president, who, in a letter to all stockholders has declared that the company will vigorously fight the U.S. Government's anti-trust suit instituted last week.

* * *

Clues in the elucidation of the structure of some unfamiliar fatty acids and possibly fresh light on certain forms of tuberculosis may result from current research, led by Prof. James Cason, at the University of California into the structure of phthioic acid, minute quantities of which have been isolated from tuberculosis organisms. The corrosive acid has been found to produce in laboratory animals lesions corresponding closely to those associated with tuberculosis. The Californian investigation is on lines closely similar to studies now in progress at Uppsala, Sweden.

* * *

The organisation of this year's 22nd Exposition of Chemical Industries has been planned on a scale rivalling any previous enterprise. It will be held in the Grand Central Palace, New York City, during November 28-December 3. All available space on the Palace's four floors will be required. Exhibits will be composed of raw materials, machinery and products covering every recognised industrial and commercial application of chemical materials, from medicinal preparations and foodstuffs to such things as paper, plastics, dyes, and related chemical products. The 50,000 visitors at the last of these displays, held in 1947, represented nearly 60 different industrial groups. E. R. Weidlein, director of the Mellon Institute, is chairman of the advisory committee, composed of leaders in the major fields of interest which the exhibitors represent.

South African Buchu Leaves

It has been stated that buchu leaves, a source of camphor, essential oil and resin, are bringing about £20,000 in dollars and £16,000 in sterling annually to South Africa. The Union's annual crop is estimated to be between 600 and 700 bales, of which 75 per cent is purchased by the U.S.A. and the rest by Britain. Prices have risen during the last ten years, from between 8d and 9d. per lb. in 1938 to 3s. 6d. per lb. in 1948.

R.T.B. METHODS OF ANALYSIS. Richard Thomas and Baldwins, Ltd. 1949. London. 2 guineas. Pp. 112.

The taste for empiricism in analytical chemistry is still, unfortunately, not dead, as the present work all too obviously shows. In a prefatory note, it is stated that the object of the publication is primarily " to place on record, for the benefit of our own laboratories, the methods of analysis which are used by each section of the organisation." No originality is claimed for the methods. The note adds that in fact the origin of many of them is unknown. These points are abundantly clear when the book is read and the question is raised whether the objects could not have been achieved by some other route.

The reviewer is forced to the conclusion that each section has submitted its own rule-of-thumb methods and has rigidly persisted in their inclusion in defiance of the heterogeneity which results. This is best illustrated by example. For the determination of phosphorus by the molybdate method four procedures are given, with little or no indication as to their respective merits. After preliminary treatment, the instructions in three of these methods are as follows:—

> " Method A.—Cool to 60° C., add 50 ml. ammonium nitro-molybdate solution, shake for at least two minutes and allow to settle at 50° C. for 15 minutes. Filter through pulp, washing first with cold dilute nitric acid and then with dilute potassium nitrate solution. . . . Transfer the pad and precipitate to the original beaker, add, from a burette, a measured excess of N/10 sodium hydroxide, followed by about 50 ml water, . . . and titrate with N/10 sulphuric acid or nitric acid.
>
> " Method B.—Add 40 ml. ammonium nitrate solution and adjust the temperature to 80° C. Add 40 ml. ammonium molybdate solution, shake for three minutes and allow to settle in a warm place for thirty minutes. Filter and complete the determination as directed in Method A.
>
> " Method C —Adjust the temperature to 80° C., add 50 ml. ammonium nitro-molybdate solution, shake for at least two minutes and allow to settle at 60° C for 15 minutes. Filter through pulp and wash the beaker and pad with cold water until free from acid. Return the precipitate and pad to the original beaker, add about 100 ml water and titrate with N/6 74 sodium hydroxide and N/6.74 sulphuric acid as described in Method A."

No reasons are given for these minor variations. In the opinion of the reviewer, no justification exists for presenting publicity this *olla podrida* without adequate theoretical backing. Even the routine assistant, if he has anything of an inquiring mind, may lose confidence in the procedure which he has been accustomed to follow, when he is presented with a range of temperatures and settling times which seem to make irrelevant all that he has been taught of rigorous adherence to analytical procedures.

The methods are arranged in four sections, dealing with ferrous metals, non-ferrous metals, raw materials and slags, and miscellaneous methods. In a book covering this range, there is a notable shortage of precise colorimetric methods, the few included either depending on matching methods in Nessler glasses, or being relegated to a quite inadequate minor section, which is difficult to track down.

Several appendices are included dealing with the physical constants of elements, strengths and equivalents of standard solutions and the like. The section on preparation of standard solutions demands comment. Standardisation of N/10 dichromate by ferrous ammonium sulphate is advocated. In the succeeding paragraph standardisation of ferrous ammonium sulphate against dichromate is the recommended procedure.

C.L.W.

RUSSIAN SCIENCE READINGS (Chemistry, Physics, Biology). L. Light, Ph.D. 1949. London: Hirshfield Brothers. Pp. 98. 7s. 6d.

This reader is claimed by the publishers to be the first of its kind. Certainly within the knowledge of the reviewer there is no other Russian reader devoted exclusively to science readings. The subject matter is, of course, elementary. It is taken from school text books on physics, chemistry and natural science but, for an introduction, this is certainly no defect. The material is exceedingly well annotated, a very necessary aid with so inflected a language as Russian and one in which idiomatic expressions are so frequent. In view of the critical interest in scientific publications in the Russian language this modest introduction will certainly serve a useful purpose.

Technical Publications

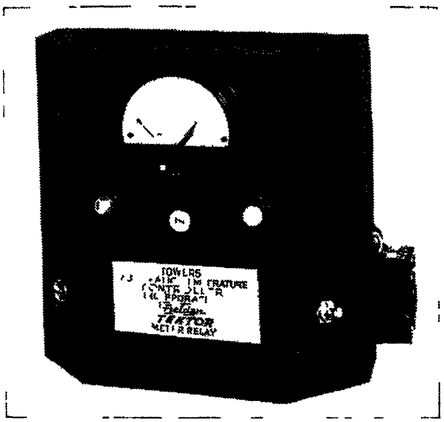
CLAIMED to be the first instrument of its kind, a new automatic temperature controller has been devised by J. W. Towers & Co., Ltd., Widnes. Based on electronic principles, the instrument is operated by a thermocouple placed inside an electric furnace and consists of a pyrometer indicator graduated in degrees C. fitted with an additional pointer which is set at the required temperature. This pointer is connected to a Fielden Tektor meter relay circuit. When the temperature indicating needle reaches it, the electrical capacity of the circuit is affected and a relay is operated, switching off the supply to the furnace. Similarly, when the temperature drops, the supply is switched on again. The accuracy of the controller, described in the company's latest pamphlet, is largely dependent upon the length of scale of the pyrometer indicator and type of furnace used.

* * *

A NEW patent (No. 2,433,989), providing a means for automatically supplying distilled water to storage batteries, has been made available for licensing or sale through the United States Patent Office by Hans J. Hansen, 343 North Lorel Avenue, Chicago, Illinois. It concerns an automatic filling device for replenishing distilled water to storage batteries to maintain the battery grids submerged in the electrolyte at all times. The device, in a transparent container, employs an automatic valve which opens to establish water passage to the cells and closes when the cells are filled.

* * *

RECENT technical papers abstracted in the June issue of *The Nickel Bulletin*, published by the Mond Nickel Co., Ltd., include L. S. Fulton's "Forging Alloys for High Temperature Service," of special interest in view of its bearing on the construction of gas turbines. The issue (*22*, 6), also contains reference to the first report in a series covering an investigation of the factors governing notch toughness in ferritic materials. This instalment deals with the effect of grain size. "Nickel Alloys v. Hydrochloric Acid," the concluding item in a symposium in Corrosion Forum, is another subject of special interest. The 76th Annual Mint Report, containing references to nickel and cupro-nickel coinage, is briefly reviewed.



The Towers electronic automatic temperature controller, used normally as a wall fitting in an enamelled metal case with short cable connections to the furnace

TEN years of co-operative research have gone into the production of the British Colour Council's dictionary of colours. The work, which is in three volumes, lists 378 authenticated colours, with a note of their history.

Electrochemical Research

THE Government of India has deputed an Indian scientist, Dr. B. K. Ramprasad, to proceed shortly to Japan to purchase equipment for the proposed electrochemical research institute, at Karaikudi in South India, one of the eleven national laboratories which are being set up by the Indian Council of Scientific and Industrial Research.

Indian Trade and Industry reports that the institute is the first of its kind in India to be on the lines of the electro-chemical research institute in Berlin and those in the U.S.A. At the outset it will have two main divisions—electrolytic and electrothermic. In addition there will be auxiliary laboratories and workshops and analytical and chemical engineering sections.

Investigations will cover problems relating to a variety of subjects like production of heavy water, other inorganic substances and organic chemicals by electrochemical methods, electrodeposition, electrometallurgy, electrolysis of salts.

◆ PERSONAL ◆

A JOINT committee of the Royal Society and the Armourers' and Brasiers' Company has appointed Mr. Robert William Kerr Honeycombe, of the Cavendish Laborator, Cambridge, to the Armourers' and Brasiers' Research Fellowship for two years from October 1, 1949. The appointment is renewable year by year for a further three years. Mr. Honeycombe will work on the inhomogeneity of plastic deformation in metals, and the influence of these inhomogeneities on recrystallisation and recovery.

Sir Harold Hartley, F.R.S., chairman of the British National Committee and International Executive Council of the World Power Conference, has been named as chairman of the Electricity Supply Research Council, set up by the British Electricity Authority. Other members who have accepted invitations to serve are: Sir Edward Appleton, F.R.S., Prof. F. E. Simon, F.R.S., Sir David Brunt, F.R.S., Prof. H. W. Melville, F.R.S., Sir Geoffrey Taylor, F.R.S., Mr. V. A. Pask, and Mr. C. W. Marshall. Additional nominations will be made to represent the Electricity Boards.

Among those on whom the degree of Ph.D. were conferred at the University of Aberdeen recently was Mr. J. D. Burnett for a thesis on "The Photopolymerisation of Vinylidene Chloride"; Mr. A. J. R. Murray: "The Ultrasonic Degradation of High Polymers"; and Mr. L. Mack. Valentine: "The Mechanism of Copolymerisation Reactions."

Sir John Cockcroft, director of Research, Atomic Energy Research Establishment, Harwell, is to visit South Africa next month. It is thought that he will advise on the possibilities of establishing an atomic research commission in the Union to work in conjunction with the British organisation at Harwell.

Sir C. V. Raman, head of the Institute of Physics, Indian Institute of Science, Bangalore, has been elected a foreign associate of the Paris Academy of Sciences in succession to the late Prof. G. H. Hardy.

Sir Roland Nugent, Minister in the Senate, has been appointed by the Minister of Commerce, Northern Ireland, to be chairman of the Council of Scientific Research and Development in succession to Sir David Lindsay Keir.

Mr. Alexander Ogilvie, of Aberdeen, now a consultant with the Sturtevant Engineering Co., London, has returned from a visit to Australasia where he is to take part in large-scale aerial fertilisation of hill country with granular material. Mr. Ogilvie was trained with Barry, Henry and Cook, Ltd., Aberdeen, and has specialised for the past 30 years in chemical fertilisation techniques. It is intended to use granular fertilisers in the aerial projects which he surveyed during this visit.

The managers of the Royal Institution have awarded the Actonian Prize for 1949 of 100 guineas to Sir Alexander Fleming, for his 1945 paper, "Penicillin—Its Discovery, Development and Uses in the Field of Medicine and Surgery." The prize has been awarded every seventh year since 1938 under a trust established in that year by the late Mrs. Hannah Acton.

Mr. Morley T. Parry, chief sanitary inspector to the County Borough of Northampton, has been appointed Food Hygiene Advisory Officer from August 3. He will operate from the Ministry of Food and will advise local authorities on their food hygiene problems.

Lord Boyd Orr was last week presented with the Harben Medal for "eminent services rendered to the public health," at the meeting of the Royal Institute of Public Health and Hygiene.

Wills

Mr. James Woodhead, retired manufacturing chemist, late of Godfrey Woodhead & Son, Ltd., Britannia Chemical Works, Slaithwaite, left £32,917.

Mr. Matthew Forrest, a former director of William Forrest & Son, Ltd., Paisley, and W. C. Hodkinson, Ltd., Glasgow, left £33,439.

Mr. George Dale, of Warrington, formerly for over 35 years technical manager of the fuel department of Joseph Crosfield & Sons, Ltd., left £1470.

Mr. Herbert Wareing, of Chorley New Road, Lostock, Bolton, manufacturing chemist, left £24,918 (£23,680 net).

Obituary

The death has occurred of Mr. Harry Collinson, 47, a plant engineer of the staff of Brookhirst Electrical Swithgear, Ltd., Chester.

· HOME ·

Purchase Tax Remitted

Scientific instrument cases are included among the categories now made exempt from Purchase Tax as from July 25 by a new ruling of the Treasury, "Purchase Tax (No. 2) Order, 1949."

Scholarships for Research

The trustees of the Courtaulds Scientific and Educational Trust Fund have awarded post graduate research scholarships in a branch of science related to the textile, plastics or other allied industries to C. T. Greenwood and I. A. Wilkinson, both of Birmingham University.

Amino Acids Symposium

A four-day symposium on amino acids and protein hydrolysates will be held in London from September 28-30 by the Food Group of the Society of Chemical Industry. The opening address will be given by Prof. E. C. Dodds and meetings will be held in the William Beveridge Hall, Senate House, London University.

PLA Entertains Publishing Staffs

On the day following the settlement of the dock strike (July 23) some of the editorial and advertising staffs of the Benn group of trade journals, which includes THE CHEMICAL AGE, were the guests of the Port of London Authority on the s.y. *St. Katherine*, in a tour of the Royal docks. An interesting commentary on the features of the River docks and ships was given by Mr. E. T. Malone. of the PLA Information Department, and Admiral Sir Alan Geoffrey Hotham, a member of the PLA Board, also explained and commented upon various aspects of the Port services.

Petrochemicals Plant Nears Completion

Less than three years after construction began, the petroleum plant for Petrochemicals, Ltd., at Partington, Cheshire, is nearly completed. It should be finished by the end of the year, and will be supplemented later by an oil refinery with a capacity for 1500 tons. That is planned for 1951. The scheme is capable of effecting economies equivalent to $8 million a year in its initial stages. The immediate production programme embraces the manufacture of over 60 intermediates for the textile, pharmaceutical, paint, rubber, printing ink, and other industries. Some of the chemicals will be marketed here for the first time on a commercial scale.

Cement Industry Holidays

Workers in the cement-making industry are to get a second week's holiday with pay, beginning in 1950, under an award of the National Arbitration Tribunal.

Coal Output

Last week's total coal production in Britain was 527,900 tons less than in the previous week, due to holidays. Comparative figures are:—Last week: 3,657,800 tons (deep-mined 3,442,300 tons, opencast 215,500 tons); previous week: 4,185,700 tons (deep-mined 3,891,900 tons, opencast 293,800 tons).

Scottish Bulk Oil Store?

The Anglo-Iranian Oil Company and Scottish Oils, Ltd., are mentioned as being interested in negotiations said to be in progress aimed at providing bulk oil storage in the Firth of Clyde area. Such a scheme would cost about £1.5 million and would make use of a deep water loch, serving as a bulk store for the refineries at Grangemouth, to which there would be a pipe line.

Mining Explosives

The Ardeer factory of I.C.I., Ltd., at Stevenston, Ayrshire, was visited last week by 60 delegates and members of the Fourth Empire Mining and Metallurgical Congress. The visitors were particularly interested in the section for testing explosives before they are sent out for use in coal mines and mining generally.

New Medical Film

THE British Medical Association with the support of Glaxo Laboratories, Ltd., is to produce a film on "The Treatment of Infections of the Fingers and Hands," which, it is hoped, will contribute towards greater efficiency in industry. The hand is most vulnerable to minor injury and accounts for a good deal of wasted man-hours.

The film will provide a record of the latest technique available for dealing with such conditions as poisoned fingers, whitlows, abscesses, infections of the nail-bed, and so on. Primarily intended for the practising doctor, whether specialist or general practitioner, it will also be valuable in the training of medical students.

The Hand Clinic of University College Hospital, London, is preparing the film, with Mr. A. G. Riddell as clinician in charge. It is likely to be distributed in February next year.

• OVERSEAS •

Fewer Refractory Bricks

High cost of fuel and labour has enforced a large reduction in Italy's output of solid refractory bricks. Production dropped 20 per cent in 1948.

Lever Bros. Expanding in U.S.A.

Work has begun at Los Angeles on a $25 million (£6.25 million) soap and food products factory for Lever Brothers as part of the company's $55 million expansion programme.

U.S. Refinery Fire

A series of explosions and a fire which swept through the Standard Oil refinery in South-East Baltimore on July 21 were reported to have injured at least 22 people, six of them seriously. Flames leaped 300 feet over the buildings as two big fuel stills exploded.

U.S. Aluminium Output

Production of primary aluminium in the U.S.A. in April totalled 540,076 short tons. This was about 1 per cent less than the figure for March because of the shorter month, but average daily output was the highest level since August, 1944. Month-end stocks at reduction plants on April 30 remained practically unchanged with a total of 11,746 short tons.

Industrial Alcohol Losses

The decline in the market values of molasses and industrial alcohol, which necessitated a write-down of raw materials and finished stocks, is reported to be the cause of the loss shown by the Canadian Industrial Alcohol Co. in the three months ended May 31, 1949. The net loss was $85,418 compared with a net profit of $410,482 for the same period in 1948.

Sweden's ECA Purchases

Some indication of the proportional import requirements of Sweden in relation to purchasing licences granted by ECA, Washington, is given by a recent announcement of the ECA delegation in Stockholm. This states that three-fifths ($24.6 million) or the $41,495,000 allocated since the commencement of Marshall Aid has been used to buy oil and petroleum products. Other purchases are: machinery $5 million, chemicals $2.1 million, iron and steel products $1.9 million, metals other than iron $1.4 million, and vehicles and spare parts $1.2 million.

U.S. Seeks Uranium Agreement

Renewal of the agreement with Belgium and Britain is sought by the U.S. Government to continue buying uranium ore from the Belgian Congo, according to a *Reuter* report. The present agreement between the three countries was made in 1944 and expires this year.

Use of Asphalt Compulsory

Alarmed by spreading use of bitumen of petroleum origin for road surfacing in Sicily, the Government of this region has approved a law whereby all roads in Sicily are to have an asphalt surfacing within 10 years. This measure has been dictated by the desire to protect the asphalt production at Ragusa.

Canadian Undertaking Sold

Light Alloys, Ltd., Renfrew, Ontario, an industry which has been engaged in manufacturing magnesium castings for British and Canadian jet propulsion engines since 1946, has been sold to Dominion Magnesium, Ltd., of Toronto. The plant has employed 150 men and lately added new equipment for sand casting costing $250,000. Dominion Magnesium has applied for authority from the Atomic Energy Control Board to use its laboratories for the assaying of radioactive ores. There is a heavy flow of ore for assay to the Ontario Department of Mines and the Dominion Government, with a resultant delay in report for prospectors.

Ammonia in Norway

A NEW Norwegian ammonia plant, a unit of Norsk Hydro, will be put into production this month in Glomfjord, north of the arctic circle in Norway. The plant will be operating at full capacity by 1950, producing 150 tons of liquid ammonia daily. The output will be transported to Norsk Hydro's saltpetre works at Heroya by three new specially constructed tankers. There it will be reprocessed for use in a variety of chemical products. Nitrogen products are an important classification in Norway's export list.

The company's saltpetre plant at Heroya is being expanded to afford a 50 per cent increase in output by 1950. The 150-ton daily capacity of the Glomfjord ammonia plant corresponds to about 250,000 tons of lime saltpetre per year.

SCOTTISH PLANT AND CHEMICALS

Wide Range of the September Exhibition

THE chemical and allied industries will be well represented among the 320 firms which will be occupying stands at the Scottish Industries Exhibition to be held at Kelvin Hall, Glasgow, from September 1-17.

Imperial Chemical Industries, Ltd., will concentrate mainly in making known the work of the Nobel division, showing explosive and non-explosive products, but will also show dyestuffs and pharmaceuticals from its Grangemouth plant.

The wetting agent and detergent, Iranopol, derived from petroleum will be one of the main features of Irano Products, Ltd., a subsidiary of Anglo-Iranian Co., Ltd.

Products from one of the most modern factories in the United Kingdom, recently established in Scotland, will be exhibited by Boots Pure Drug Co., Ltd.

Tubocurarine chlorine, processed from the Indian poison curare, now being used to cause muscular relaxation and to control convulsions and paralysis is being shown by Duncan, Flockhart & Co., Ltd., Glasgow. This firm prepared the chloroform first used by Sir James Y. Simpson in 1847, who pioneered its anæsthetic uses.

The Distillers Co., Ltd., includes in the industrial products to be represented at Glasgow, acetone, butyl, alcohol, acetic acid, acetic anhydride; methylated spirit, carbon dioxide (liquid and solid), ethyl alcohol, penicillin, and a wide range of raw materials for the plastics industry.

Electric and industrial heaters for heating water, oils, acids, alkalis, etc., are among the exhibits of Low, Duncan, Ltd.

Samples of the uses of hard chrome and the uses of electro-deposited finishes including zinc cadmium, tin, silver, gold, rhodium. etc., will be demonstrated by Electro Platers, Ltd., Glasgow.

J. R. Mckellar (Alloys), Ltd., Glasgow, will be showing castings in gun metal, phosphor bronze, nickel alloys, etc., for high duty uses.

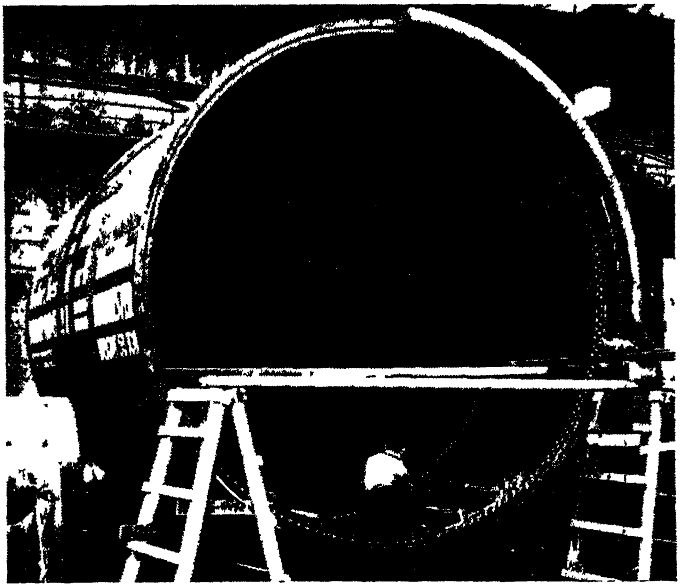
White lead and lead oxides and a wide range of paints, colours, varnishes, sheet lead and lead pipe will be displayed by Alexander Ferguson & Co., Ltd., Glasgow.

Plastics will be represented by two firms. Aeroplastics, Ltd., whose factory is equipped with compression transfer side-arm and injection moulding presses and Aeroplast, Ltd., fabricators and mouders of thermoplastic sheet.

High grade precision instruments, high vacuum plant for metallic films on glass and other scientific instruments will be featured by Barr & Stroud, Ltd.

Outsize Vulcaniser

This curing pan, the largest ever made in Britain, was recently installed in the Dunlop Rubber Company's factory at Cambridge Street, Manchester. Manufactured by Foster. Yates and Thom, Ltd., Blackburn. its weight is 58 tons, the door crescent alone weighing 13 tons. Over 26 ft. long, it has an inside diameter of 15 ft. The pan will be used for vulcanising rubber-lined tanks and similar vessels, largely for chemical processing



Chemical and Allied Stocks and Shares

HOLIDAY factors have further reduced stock market business and prices in most sections showed small irregular movements, although sentiment was helped by somewhat firmer conditions in British Funds. In the prevailing view, markets are likely to remain inactive until the autumn. It is felt that if there is not a reversal of the downward trend in exports to the U.S.A. in the next three months more drastic cuts in our imports may be inevitable. Devaluation of sterling would be accepted only as a last resort.

Markets seem, nevertheless, to be following the line that it is wise to be prepared for the worst. Speculative interest significantly tends to centre on gold mining and similar shares. Shares of companies which have important U.S interests or which are big exporters to America also remain in favour. Otherwise, markets for the time being are moving fairly closely with British Funds, which appear to fluctuate rather sharply on moderate buying or selling.

Leading chemical and kindred shares were moderately lower on balance, Imperial Chemical at 43s. 4½d., but Monsanto have kept steady at 51s. 3d., and United Molasses have remained firm at 39s. 3d. Brotherton 10s. shares were again 20s., with Albright & Wilson 27s. 9d., Amber Chemical 2s. shares 5s., Boake Roberts 30s., and F. W. Berk 2s. 6d. shares 13s. Laporte Chemicals 5s. shares held their rise to 21s., Fisons were 44s., and British Glues & Chemicals 4s. shares have been firm at 18s. 9d. The latter company is among those which the market believes are in a position to distribute a share bonus.

Shares of companies with plastics and kindred activities have been inclined to attract more attention. De La Rue, with a rise to 29s., were good on the financial results and maintained 50 per cent dividend on these 5s. shares. British Industrial Plastics 2s. shares were 4s. 10½d., British Xylonite 67s. 6d., and Kleemann 11s.

The 4s. units of the Distillers Co. have eased to 26s., despite the financial results and 50 per cent share bonus. Amalgamated Metal strengthened to 18s. 1½d. on further consideration of the results. Glaxo Laboratories 10s. shares strengthened to £18. This is a case where earnings on the shares are well in excess of dividends paid and reserves and financial resources are substantially more than the actual issued capital, suggesting the possibility of a bonus sooner or later. Triplex Glass 10s. shares have further strengthened to 20s. 9d. in anticipation of the financial results. Dunlop Rubber fell back sharply to 61s. 6d. on reports of increasing competition in export markets, and elsewhere, Boots Drug have come back to 48s. 6d. since publication of the report and accounts. Iron and steel shares were fairly steady. Staveley were 77s., and General Refractories 23s. 4½d. Lever & Unilever eased to 44s. 3d., the prevailing view being that the full accounts and annual statement give little ground for hopes of a higher dividend in the future. Lever N.V. shares were also 44s. 3d. Oils have been firmer, although Ultramar fluctuated sharply, awaiting the results and news of the company's capital plans.

U.K. PRODUCTS FOR ITALY

AN important outcome of the recent meeting in London of the Anglo-Italian Joint Economic Committee was the granting of licences by the Italian Government for the acceptance of United Kingdom manufactured goods on a scale considerably above the level fixed in February this year.

Quotas now agreed will cover the period January 1, 1949, to June 30, 1950. The following commodities were included in the increased quotas:—

Ball clay: optical glass unworked; laboratory and industrial glassware; graphite crucibles; plumbago and graphite products; special resistance wires and tapes; scientific instruments (other than electrical); electronic equipment: electro-medical apparatus; plastic injection moulding machinery; insecticides; prepared drugs and pharmaceutical preparations; chemicals for industrial use.

In addition, the Italian Government decided to license the following commodities for which no quotas have previously been granted:—

Carborundum and emery for optical use; aluminium paste; X-ray apparatus and films; oxides and salts of nickel and cobalt; latex compounds.

It was also arranged by Italy to extend to certain types of industrial plant, equipment and machinery imported from the United Kingdom credit facilities similar to those at present extended to imports from the U.S.A. under the ERP system. These credits will cover goods up to a total value of £10 million.

Company News of the Week

New Registrations

Metal Chemical Treatments, Ltd.

Private company. (470,832). Capital £100. Electro-chemical engineers. Directors: W. Elles-Hill, T. O. M. Pope, A. J. Milne. Reg. office: 50 Gresham Street, E.C.2.

Sibley, Ravenscroft & Co., Ltd.

Private company. (470,880). Capital £1000. Manufacturers and moulders of thermo-plastic, thermo-setting plastic materials, plaster and light metal alloys, etc. Directors: I. L. J. Sibley, W. H. A. Ravenscroft. Solicitors: Simon Haynes & Co., Brighton, E.

Colloidal Graphite, Ltd.

Private company. (470,858). Capital £1000. Manufacturers of substances, materials and goods in which colloidal graphite is used: processors and refiners of lubricating oils, petroleum products, fuel oil, abrasives, chemicals, etc. Reg. office: 8 Southampton Row, W.C.1.

John Beith (England), Ltd.

Private company. (471,068). Capital £1000. Manufacturers of chemicals, gases, fertilisers, etc. The first directors are not named. Reg. office: 15 George Street, Mansion House, E.C.4.

Company News

W. J. Bush and Co., Ltd.

At the annual meeting of W. J. Bush & Co., Ltd., in London this week, the chairman, Dr. Percy C. C. Isherwood, said that net profit for the year amounted to £172,624, a reduction of £27,723 on the previous year's figure. The directors had decided, in view of unsettled market conditions, to place £100,000 to stock-in-trade reserve, and a further sum of £20,000 had been provided for deferred repairs. A final dividend of 8 per cent on the ordinary shares (total 12 per cent) and a bonus of 6d. per share were approved.

The Distillers Co., Ltd.

The consolidated manufacturing and trading profits of The Distillers Co., Ltd., and its subsidiaries for the year ended March 31, 1949, amounted to £10,361,857 (£11,182,411). After crediting income from investments £725,629 (£841,653) and over-provision for taxation, and charging depreciation £507,095 (£476,527), other provisions, income tax £3,787,170 (£3,999,190), and profits tax £1,692,469 (£2,021,959), there remains £5,130,597 (£5,676,078). The proportion of this profit to be received by the Distillers Company is £3,408,851 (£3,620,833). Payment of a final dividend of 9.6d. per 4s. unit of ordinary stock (less tax) is recommended, making a distribution for the year of 1/1.2d. per unit. £1,001,889 is carried forward, as against £887,051 brought in. The board is to recommend an increase of the authorised capital from £20 million to £35 million; and the capitalisation from the company's reserves of £7,512,923 to allot to the ordinary shareholders one new ordinary share of £1, fully paid for every complete £2 stock held.

Goldthorpes (Chemists).

Working capital has been increased by the addition of £30,500 and profits before taxation were £22,842 for the year ending March last. Dividend of 25 per cent was proposed.

Lever Bros. & Unilever, N.V.

An expansion in value of sales in 1948 was recorded with a turnover of £617.508 million compared with £479.312 million in the previous year. Consolidated net profit increased from £8,512,144 to £10,458,709. Ordinary dividend of the English company was maintained at 10 per cent and of N.V. at 8.9 per cent.

Morgan Crucible Co.

Consolidated current assets to March 31, 1949, £4,075,127 (£3,931,894). Trading profit reduced by £177,507, but an increase of £17,443 in amount available for appropriation from reservevs no longer required. The final ordinary dividend, 12 per cent, is unchanged.

Murex, Ltd.

Preliminary figures of Murex, Ltd., for the year ending April 30, 1949, show profit of £282,000 (£215,000), and taxation provision £298,000 (£220,000). The customary dividend of 20 per cent, less tax, is recommended.

International Bitumen Emulsions

The International Bitumen Emulsions report for the year ending March 31, 1949, showed a decline in profits by £29,000 to £92,000 mainly due to a smaller demand for paints. Lower tax charge, however, partly offset this effect, so that final net profit was £36,000. Dividend of 15 per cent was maintained.

Prices of British Chemical Products

Rates Easier for Several Basic Materials

CONDITIONS on the industrial chemicals market have remained practically unchanged during the past week, with a fairly satisfactory demand from home consumers continuing. Inquiries on export account are being reasonably well maintained. Among the soda products a steady demand persists for soda ash, caustic soda, bicarbonate of soda and chlorate of soda and the potash chemicals continue in good request on a firm price basis. The coal-tar products market is quiet and without special feature.

MANCHESTER.—Trade in chemical products on the Manchester market during the past week seems to have been more under the influence of seasonal conditions, although, when account is taken of this, business has been on a fair scale, especially in soda ash, caustic soda and most of the lines in regular use. Actual deliveries to the cotton and woollen industries and other leading users have been affected by holiday stoppages, but this interference will, of course, gradually become less in evidence within the next week or two. A fair amount of inquiry from shippers for a good range of products has been reported.

GLASGOW.—The Scottish chemical market is continuing very quiet during the holiday season. There are indications, however, that there may be some heavy buying during August. The demand for coal tar products continues to increase and that for formaldehyde for horticultural purposes is growing heavier.

Price Changes

Rises: White lead, magnesite, sodium sulphide.

Reductions: Acetic acid, acetic anhydride, industrial absolute alcohol, antimony oxide, bleaching powder, calcium chloride, copper sulphate, lead carbonate, lead nitrate, red lead, litharge, magnesium chloride, methylated spirit, caustic soda, sodium bicarbonate, sulphuric acid, titanium oxide, pitch.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots, d¾d, £101 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40 45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder. Spot, 35/37%, £11 to £11 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial. granulated, £27 10s.; powdered, £30. extra fine powder, £31; B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £48; crystals, £53; powdered, £51-£53; extra fine powder, £53. B.P., crystals, £61; powder, £62; extra fine, £64; anhydrous borax, dehydrated borax, £48 per ton in 140 lb. bags.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. 7½d. per lb.

Copper Carbonate.—Manchester: 1s. 6d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 9d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 7d. per lb.

Copper Sulphate.—£36 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about. £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. Manchester: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, 120s. to 122s. per cwt

Lead Carbonate.—British dry, ton lots, d/d, £109 10s.

Lead Nitrate.—About £116 per ton d/d in casks. Manchester: £93.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £99; orange lead, £111. Ground in oil: red, £123 orange, £135. Ready-mixed lead paint: red, lots of 20 gals. and under 160 gals. in 1 gal. tins uncrated, £2 3s. per gal.; orange, 3s. 6d. per gal. extra over the price for red.

Lead, White.—Dry English, in 8-cwt. casks, £109 10s. per ton. Ground in oil, English, under two tons, £130.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£99 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical. £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d. in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

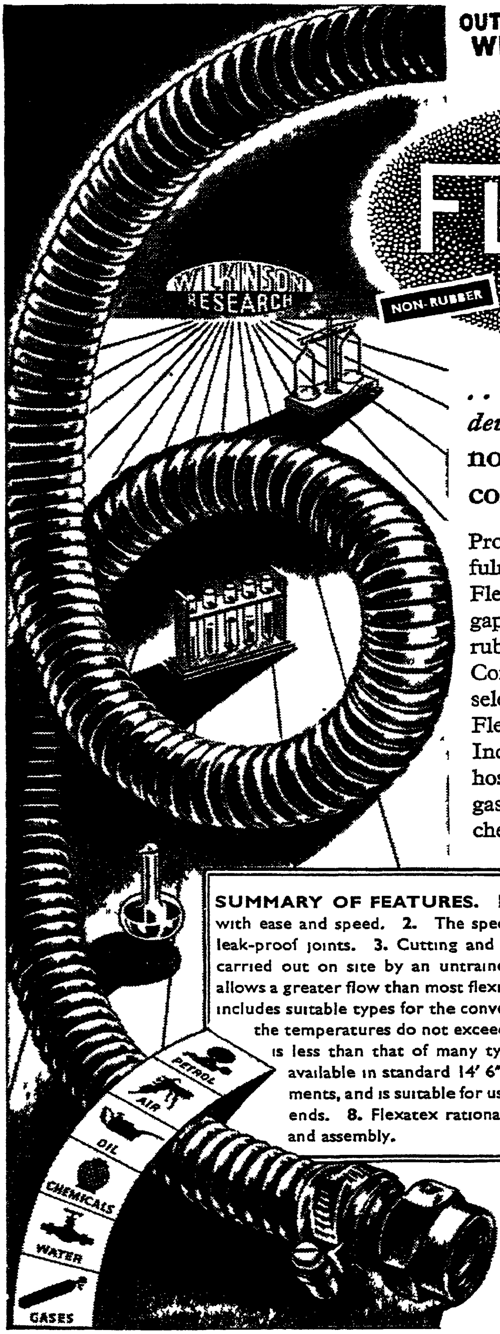
Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.



OUT OF THE
WILKINSON RESEARCH
LABORATORIES *came*

FLEXATEX
flexible **HOSE**

. . . one of the great synthetic developments during the war . . .
now making an outstanding contribution to industry.

Product of the experience and resourcefulness of the Wilkinson Research Chemists, Flexatex non-rubber flexible hose filled the gap caused by a war-time shortage of rubber . . . and it has come to stay! Constructed from materials specially selected to suit varied industrial conditions, Flexatex has proved its value in all fields of Industry. There are types of Flexatex hose suitable for a wide range of fluids and gases and for use where resistance to oil and chemicals are of paramount importance.

SUMMARY OF FEATURES. **1.** End connections can be fitted to Flexatex with ease and speed. **2.** The special construction of Flexatex ensures positively leak-proof joints. **3.** Cutting and assembly of Flexatex and end fittings can be carried out on site by an untrained operator with ordinary tools **4.** Flexatex allows a greater flow than most flexible hoses of equal bore. **5.** The Flexatex range includes suitable types for the conveyance of a wide range of fluids and gases where the temperatures do not exceed 70°C. **6.** The weight per foot run of Flexatex is less than that of many types of ordinary flexible hoses **7.** Flexatex is available in standard 14′ 6″ lengths which can be easily cut to any requirements, and is suitable for use with standard A.G.S. parts, straight or beaded ends. **8.** Flexatex rationalises the whole method of flexible hose supply and assembly.

For full details, and a comprehensive survey of the practical applications of Flexatex Hose, write for the MANUAL OF TECHNICAL DATA for FLEXATEX. Specific information will also gladly be supplied to enquirers, who should give details of fluids or gases to be conveyed.

WILKINSON RUBBER LINATEX LTD., FRIMLEY ROAD, CAMBERLEY, SURREY.
Tel : Camberley 1595 Also in Canada, Australia, South Africa, U S A , Belgium, Holland, Scandinavia, Malaya, etc.
Also makers of Linatex 95% Pure Natural Rubber Linatex Ball Mill and the Linatex Pumps

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £61 5s.; green seal, £60 5s.; red seal, £58 15s.

Zinc Sulphate.—£31 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in July, £9 17s. 6d., rising by 1s. 6d., per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 6s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2 raised from £10 8s. 6d. to £10 18s. per ton, due to increase in potash content, as notified in new Board of Trade Order.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 21s. 6d. to 22s. 6d. per gal.; 90/160°, 19s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—July 27. Unrefined, per ton, naked ex works: Linseed oil, £138; foots, £88; castor oil crude firsts, £110; seconds, £103; oiticica oil, £100. The prices of all other unrefined oils and fats remain the same (THE CHEMICAL AGE, *60*, 810) during the 5-week period ending August 6. The prices of refined oils are also unchanged until September 10.

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Germany's Non-Ferrous Metals

FROM the shock and chaos of the surrender in 1945, the German metal industry—miners, smelters and semi-fabricators—passed into a state of coma and inactivity. The enormously inflated currency being practically worthless and the metal prices being pegged by the Control Commission on the 1938 levels, regardless of subsidies paid by the Nazi Government at that time, all incentive to work, produce or trade had vanished. Stocks would obviously in time be worth more than the reichsmarks which they would realise, and were concealed to evade the orders of the occupation authorities that production and trading must be resumed. The result was a very limited amount of trading by barter, despite the somewhat illogical base in this form of trading.

It was not until the early summer of 1946 that the Control Commission took in hand seriously the task of bringing the German economy into operation again, but the most obvious of measures, the provision of a worthwhile currency, was delayed until June, 1948, largely by the long-drawn-out negotiations with the Russians to achieve agreement on a universal currency for Germany. Stocks of concentrates, scrap, ingot and semi-fabricated metals were immense, but lay idle from lack of incentive to trading.

The Metallurgical Industries (Non-ferrous) branch of the Control Commission was the first to form a German planning and control organisation with, as its first task, a census of stocks and workable capacity. This office came into operation in May, 1946, but, as was expected, great difficulty was experienced in extracting reliable information from stockholders. It gradually became clear, however, that copper, available in the form of concentrates, scrap, anodes, cathodes. wire bars, semi-fabricates, etc., amounted to at least 120,000 tons, lead to 90,000, zinc to 80,000, and aluminium to many thousands of tons, largely in the form of scrap. A great deal of "booty" aircraft and munitions scrap was released to the Germans by the occupation authorities, to make good the supposed dearth of metals, before the world shortage of metals to meet production for the "sellers' market" was appreciated. This was stopped in 1947.

But still nothing moved. Coal, and consequently electricity, gas and transport, was short, and labour was absent working in the black market or seeking food and other necessities of life. But, above all, there was no incentive to work because a few days of work would buy rations, such as they were. for a month and there was nothing else

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for the German people to buy.

The remedy for the state of affairs, when it had been diagnosed, was the grant of special incentives to coal miners and, under the Washington agreement of December, 1946, to pump raw materials imported at the expense of the Allied Nations into the supposedly empty pipe lines. The process began in the summer of 1947 and presented an opportunity of which the Germans took full advantage, using as arguments the difficulties of mining and smelting and the paucity of stocks.

In fact, by the end of 1947, they were demanding and obtaining imports of every non-ferrous metal, with the exception of magnesium, at the rate of $40 million a year. The production of aluminium and magnesium was forbidden by quadripartite decision at Potsdam. Stocks of bauxite amounted to nearly 300,000 tons.

The production of metals varied greatly from month to month, but the following may be taken as a reasonable average of the monthly figures in 1947: Electrolytic and refined copper, 2903 metric tons; lead, 2136 metric tons; raw zinc, 1777 metric tons; aluminium, nil.

With the advent of a worthwhile currency, goods and materials of all kinds appeared as if by magic, and produced a wave of buying and optimism, which ceased only when savings had gone and wages and salaries did not rise. The production of non-ferrous metals from indigenous sources and hoarded scrap increased steeply, including the primary production of aluminium which had been sanctioned early in 1948, until it amounted in March, 1948, to: Electrolytic and refined copper, 10,300 metric tons; lead, 8400: zinc, 7700; aluminium, 2900.

With the cessation of the wave of spending and the general shortage of money, demand fell greatly, and the above figures represent, with the exception of aluminium, a gross overproduction. The production of lead and zinc has now been restricted and Germany to-day is seeking to export 25,000 tons of lead (in addition to 15,000 tons exported in the past few months) and 12,000 tons of zinc. Copper has not so far been offered for export, but this may well occur unless means for freeing the monetary situation without destroying confidence in the currency are found. The production

(*continued on page 176*)

Notes and Comments

Defending Patent Rights

ONE of the indirect results of the trend of much post-war legislation—towards the creation of new conditions in industry and the professions—has been to confer new importance on the guardian duties of trade and kindred federations. The Patents and Designs Bill, now issued in the amended form, supplies one of the examples of this. The sweeping powers for the Government sought in the first draft of this Bill have undergone substantial modification in one or two important respects as a result of the joint intervention of the Federation of British Industries and the Trade Marks and Patents Federation in defence of originators and users of patents and patent agents. These modifications are of a kind to secure fair play for patentees and agents, thus rendering the Bill a much more practicable proposition. No legislation which unjustifiably deprives a useful section of the community of the prospect of fair reward can be good law or good for the country.. Patentees can undoubtedly be classified in the useful category, notwithstanding the inclusion among them of a sprinkling of eccentrics, and the Bill as it stood would have left them with very much less incentive for investigation in any sphere in which the Government would be likely at some stage to take a proprietorial interest.

Government's Privileges

AMONG the more conspicuous aims of the Patents and Designs Bill is the prevention of restriction of use of new principles by proprietors who can be shown not to be making adequate use of them themselves. The controversial character of that clause, which the Controller of Patents is to have the uneasy task of administering, is self evident, and when account is taken of the likelihood that the need to expand exports will be a factor in deciding whether a patent should be compulsorily licensed to others the need for safeguards does not need underlining. Some were provided, but they would not have operated when a Government Department chose to share a formerly exclusive right. The intervention of the FBI and the patents organisation has done away with this unwarranted privilege for Government agencies, who are to be treated on the same footing as other "interested persons," and has also disposed of another fruitful source of discontent among investigators whose ideas have been taken up by the Government—the great difficulty of ascertaining what use, if any, was being made of them. Government departments will now have to give an account to the patentee—unless, of course, his process has the misfortune to belong to the growing category of matters about which nothing must be said, for reasons of security.

Need for Scientists

A RENEWED warning that the number of scientists in this country is still indequate to the industrial and Government needs is contained in the second annual report of the Advisory Council on Scientific Policy, of which Sir Henry Tizard is chairman. This undoubtedly well informed view of the progress towards closing the very wide gap between demand and the supply by the universities and technical colleges of scientific workers does not accept the slightly more optimistic estimates which have lately been mentioned, and it presents incidentally one of the few observations upon the well worn topic of industrial productivity here and elsewhere which have not grown stale with repetition. The greater productivity in the U.S.A. and the industrial prosperity of certain European countries lacking some of our natural advantages are due, the council suggests, to the fact that our competitors attach more importance than we do to supplying industry with technologists of a university standard. There is little doubt that the acquirement of such qualifications, or something approaching them, is more widely sought in a good many countries than it is here and that the necessary training is more easily come by. Whether one accepts or discounts the advisory council's conclusion that the most efficient application of science is the prime condition for regaining prosperity here, the fact that the authority nearest to the Government is proving so consistent an advocate of scientific methods must confer real benefit in the long run on the rôle of science in the general economy. It is also capable, unfortunately, of heightening the Government's demands, in competition with industry, for such scientists as are available.

Impartial

ATTACKS on Government policy of tight control of industrial materials have been so widespread as scarcely to rank any longer as news. The theme, however, acquires an arresting new vitality when it is presented, as it was last week in the *Board of Trade Journal,* which is understandably not generally one of the critics of the principles of "planned economy." The spokesman in this instance was Sir John N. Barran in an address as chairman to shareholders of Barry & Staines Linoleum, Ltd. He told them (and the readers of the *Board of Trade Journal*):—

> "Year after year, since 1945, I have emphasised the contrast between the strong and universal demand for our goods on the one hand, and the obstinate thickset hedge of Government delays, stintings and prohibitions through which we are still hewing our way. But that is not all. The prices at which inadequate supplies are still doled out have been until very recently, in the case of linseed oil, something like 70 per cent above the same oil in the free market . . . . Had control sought for the most effective way to hamper our task in making dollars they could not have found a better one. Those who make such demands on the industry must know, or if they do not they are unfitted for control, that what they ask is a sheer impossibility . . ."

The doubtful old journalistic axiom . . . "man bites dog" . . . seems at first sight to have found an arresting modern parallel—until it is observed that this column in the *Journal* is headed "Advertisement of Company Meeting." The impartiality which prompted acceptance of the advertisement deserves some applause.

Attracting Chemical Workers

THE problem of attracting workers to the heavy chemical plants and the lengths to which organisations such as Imperial Chemical Industries, Ltd., are prepared to go in order to stimulate recruitment are shown in one aspect of the company's £13 million scheme for expansion at Northwich, Cheshire. It is hoped to get 3000 Liverpool and Merseyside men to settle permanently in the district over the next three years, of whom 235 are required in the next six weeks, 120 by the middle of this month. The company is offering to married men between 20 and 30 a five-day week of 44 hours and a starting wage as labourers of £5 3s. 7d. More can be earned when they have graduated to shift work or to higher grades, and married men will get a special allowance of £1 4s. 6d. a week until their wives and families are transferred to Northwich. Perhaps the most powerful incentive that can be offered nowadays is the certainty of a good house and I.C.I. has evidently gone to a great deal of trouble to make that available. Of the 3000 new houses now being built at Northwich, 2500 will be reserved for I.C.I. workers.

GERMANY'S NON-FERROUS METALS

(*continued from page* 174)

of semi-fabricates other than of lead has fallen since March 1, 1949, and will not recover until the optimistically accumulated stocks can be liquidated in the home or export markets.

The *volte face* within twelve months is complete. From demands for imports to provide stocks to re-start industry, Germany is now trying to find export markets for her surplus production of two of the most important non-ferrous metals.

BRITISH CARBON BLACK

Scope of the Philblack Project

SOME amplification of the details of the programme by Philblack, Ltd., to manufacture carbon black at Avonmouth, employing the technical processes of the Phillips Petroleum Company, of Oklahoma, U.S.A., was given by the deputy-chairman, Lt.-Col. C. P. Dawnay, at the annual general meeting of the Philblack Company last week.

The plant, he said, was designed to have a productive capacity of 50 million lb. of carbon black per annum, and it was believed, it would be the largest of the carbon black plants now being built in England. Regarding the other carbon black projects undertaken in this country, the chairman observed that there are a number of different grades of carbon black required by the rubber industry, of which Philblack supplies only two.

Hitherto the U.S. had supplied virtually the whole world demand. It was estimated that the establishment of a home industry would result in a saving of $8 to $10 million a year. Philblack, Ltd., when in full production, could make a yearly saving to this country of $4 million. The company was acquiring the lease of a site near Avonmouth and its engineers formally took it over and commenced work there on May 6 this year.

In addition to the saving of dollars, which the production of carbon black in this country entailed, it was anticipated that a profitable export trade could be developed, particularly to Australia, where the market did not warrant the establishment of a domestic industry, but where the dollar shortage was as great as in this country.

Agricultural Use of Ash

SOME degree of success is said to have attended experiments carried out in Edinburgh by the corporation cleansing department to utilise fine screened ash as soil dressing. Low-lying ground has been built up with as much as 10 ft. of finely screened ash to grow root crops directly in it. The dry weather has slightly hampered this experiment this year, but hay was successfully grown 12 months ago and the previous year. A further development is to remove the top soil and then replace it after dumping the screened ash. Although it lacks fertilising constituents, the ash appears to be able to release such components in the ground.

LINSEED SUBSTITUTES

Promising Reports on Vegetable Oils

CLOSELY following the announcement that a group under Prof. T. P. Hilditch, at Liverpool University, had discovered a substitute for linseed oil (THE CHEMICAL AGE, *61*, 141), comes news of further important research in connection with sunflower seeds.

Oils obtained from niger seeds, safflower seed and sunflowers of suitable varieties grown in East Africa and Rhodesia, states the annual report of the Colonial Products Research Council, are of high linoleic acid content. It is expected that the oil from these seeds will equal or possibly surpass that of the soya bean in value to the paint industry. The U.S.A. is the greatest grower of soya beans.

While an oil with a high linoleic acid content is required by the paint industry, an oil with a lower unsaturated acid content is needed for conversion to edible oils of good palatable quality.

"I am working at present on investigations to show whether it is variety of seed, environment or soil which is the determining factor," said Prof. Hilditch last week. "It is fortunate that there is a greater tendency towards those with lower unsaturated acid content as there would naturally be a much greater demand for production as a foodstuff than for the paint industry," he added.

"The work, by the nature of it, will have to continue for a fairly long time before we get any results. Our long-term objective is to stimulate production of these oil-giving seeds primarily in the Commonwealth, or at any rate in the sterling area countries. We want to be rid of dependence on the Argentine and as independent as possible of the United States for these oils."

German Technology

FURTHER reports on German industrial technique are now available from H.M. Stationery Office. Among these are:—

BIOS 1490. German gypsum industry (British, American and French zones), (17s. 6d.).

BIOS 1867. An investigation into the steel bridge and constructional engineering industry of Germany, (11s.).

Classified lists No. 18 (1s.) and 19 (2d.) of all reports on German and Japanese industries published up to August 31, 1948, and technical indexes, parts 1 to 6, are also on sale.

American Coke and Chemicals

Total Output of By-Products Increased

PRODUCTION of coke in the U.S.A. in 1948 established a new record for the industry with a total of 74,861,928 net tons, the highest figure ever attained. This was 1,416,078 tons (about 2 per cent) more than in 1947 and 824,111 tons (1 per cent) more than the wartime peak reached in 1944.

Comparative figures of yield and value for the previous three years and also those of 1937 are given in the table below.

These figures, compiled by the U.S. Bureau of Mines, also reflect the production of the principal coal chemicals. These increased in 1948, although yields per ton of coal carbonised decreased because of the poor quality of the coal charged and the high rate of oven operation.

Tar production increased 2,580,626 gal. over 1947; ammonium sulphate or equivalent, 34,763,170 lb.; gas 23,590,346 cu. ft.; and crude light oil, 1,110,602 gal.

The total value of coke and breeze produced and coal-chemical materials sold in 1948 reached a new record of $1,230,234,113.

Statistical Trends of the Coke Industry

	1937	1945	1946	1947	1948
Yield of coal-chemical materials per ton of coal charged:					
Tar ... ... gal.	8.67	7.95	7.82	7.78	7.60
Ammonium sulphate or equivalent ... lb.	21.84	20.22	19.79	19.66	19.52
Crude light oil ... ... gal.	2.86	2.84	2.77	2.75	2.73
Surplus gas sold or used ... ... cu. ft.	6.66	6.33	6.29	6.27	6.25
Average gross receipts for coal-chemical materials per ton of coke produced :					
Tar sold and used	$0.502	$0.447	$0.466	$0.605	$0.828
Ammonia and its compounds	$0.326	$0.356	$0.361	$0.423	$0.545
Crude light oil and its derivatives (including naphthalene)	$0.435	$0.503	$0.467	$0.566	$0.685
Surplus gas sold or used	$1.483	$1.413	$1.542	$1.678	$1.839
Total coal-chemical materials (including breeze)	$2.974	$3.069	$3.207	$3.710	$4.419

Expanded Scope of U.S. Chlorinated Benzene Industry

PRODUCTION has now begun at the new million dollar chlorinated benzene production plant of the Columbia chemical division of the Pittsburgh Plate Glass Co., at Natrium, West Virginia.

The plant, under construction for more than a year, adjoins a large chlorine and caustic soda producing equipment constructed during the early years of the war.

Production of the chlorinated benzenes marks the division's entry into the field of organic chemical compound production. Substantial quantities of chlorine will be consumed daily in the manufacturing method, which is somewhat similar to oil processing.

In the continuous chemical process, muriatic acid and monochlorbenzene are the first products. Hydrogen chloride is recovered as an anhydrous gas and then absorbed in water to produce muriatic acid of the desired strength. Monochlorbenzene in the process is separated by distillation. Para-dichlorbenzene and ortho-dichlorbenzene are recovered last and separated by distillation and crystallisation.

Among the applications of muriatic acid are the manufacture of pharmaceuticals, dyestuffs, pickling and cleaning metals, and textile dyeing. Monochlorbenzene is used as a solvent for paints, varnishes and lacquers, and in the production of insecticides, drugs and other organic chemicals.

Para-dichlorbenzene, a white crystalline material, will be produced in seven screen sizes for commercial use. It is used in a broad variety of agricultural and domestic insecticides, in the control of tree-destroying insects and deodorants. Ortho-dichlorbenzene is used as a solvent for resins, tars, gums and in the manufacture of dyestuffs.

POLLUTION OF SCOTTISH RIVERS

Possible Utilisation of Effluents

From A SCOTTISH CORRESPONDENT

SCOTTISH authorities are giving increasing attention to the causes of pollution of rivers, whether by industrial operation or by misuse of the waters for sewage disposal, and to means of prevention. Evidence currently available suggests that this position is again reaching a point where some decisive action may be forced.

The Scottish Salmon Angling Federation, meeting in Edinburgh, blamed County Councils for pollution, because of inefficient sewage disposal methods. This body is to press to have the matter ventilated and will bring home the point that local authorities are themselves largely responsible for the situation through refusal to spend money on sewage disposal.

The law on the subject was admitted to be most confused. At the same time, the Burgh of Musselburgh charged the Burghs of Bonnyrigg and Lasswade, and Dalkeith, of pollution of the Esk.

These and other complaints emphasise a new interest in pollution, and a determination to bring matters to a head is evident.

Industrial Responsibility

Industrial concerns realise that it is in their own interests that some definite action should be taken. The fact that so far they have not been predominantly to blame is no guarantee that they will have immunity in the future.

In view of the increasing costs of new materials, it has been suggested that it might be possible to reclaim more useful material from effluents. What was formerly useless waste and uneconomic to salvage may now prove of value.

Mr. David Murray, in Glasgow, has pointed to the fact that the Clyde is virtually an open sewer for chemicals from gas works, paper mills, collieries and chemical plants. The flow of the river is normally strong enough to offset some of the dangers of these waste effluents. The Kelvin is also an open sewer, for which paper mills are regarded as being chiefly responsible.

The need to develop a system of individual waste recovery, and effluent purification in the Clyde Valley was urged. Some such systems are already in existence and might be profitably adapted to the advantage of the firms concerned.

Other Scottish rivers are equally involved. There is evidence that ever in the location of new factories, rivers have been regarded as legitimate means of disposal, even of such chemicals as cyanide used in electro plating.

Spent Chemicals

It is being suggested now that the Directorate of Salvage and Recovery should investigate such disposal of spent chemicals to determine whether use could be made of them.

The intention is to tackle individual sources of material and to analyse their potential value in any other form.

Whether it would be economically feasible to salvage much more waste is less certain and a great deal of caution will be observed in advancing claims. It has been demonstrated, however, that in some instances effluent can be usefully converted.

This approach differs from that of the other bodies involved whose main attitude is based on the harm to the amenities.

Writing in the *Glasgow Herald,* a critic of the pollution of the Kelvin points out that recovery processes are already available and could be used if desired.

"Soda recovery plants operating at quite high efficiencies have been standard practice in the paper trade for many years. But pulp washing is one of the least studied processes in British mills. and it is with dilute black wash liquors that the trouble appears to lie," he points out. "These could be recovered at a cost either involving more fuel or the installation of counter-current rotary vacuum washers, so successful with wood, and adapted to the needs of esparto or straw.

Valuable Solvents

"Shortly before the outbreak of war in 1939 a scheme was put forward which would enable the papermaker to recover the soda used in his digesters and at the same time from the lignin bodies produce valuable solvents, motor spirits, and oils.

"Although sound technical advice predicted handsome over-all profits, the paper trade could not at that time be persuaded to put up the capital required to set a co-operative scheme going."

LEATHER CHEMISTS CONFER

Schedule for Next Month's Meeting

THE annual conference of the Society of Leather Trades' Chemists will be held on Friday and Saturday, September 16 and 17, at the University, Leeds.

The programme opens at 9.30 a.m. with a paper by P. Danby (leather industries department, Leeds University), on " The Chemistry of the Chamoising Process," and other speakers in the morning session will be R. G. Mitton (British Leather Manufacturers' Research Association), on " The Planning and Interpretation of Experiments on Variable Material such as Leather," and C. C. Posnett on " Leather Chemists—Control and Development."

The afternoon session will be devoted to the business meeting of the society, and committee reports, preceeded by an address on " Some Causes of Variation in the Composition of Fish Oils," by J. A. Lovern (DSIR, Food Investigation, Torry Research Station, Aberdeen).

On Saturday morning there will be two papers: " Some Physico-Chemical Aspects of Leather Dyeing," by W. Siddall (science department, Northampton College of Technology); and " The Manufacture of Hide Glue and Gelatine," by W. M. Ames.

VALUABLE COAL CHEMICALS

AN indication of the value of some of the various chemical and other by-products derived in association with the production of manufactured solid fuel was given by the chairman of Coalite and Chemical Products, Ltd., Commander Buist, at the annual meeting of the company in London last week. Evidencing the company's contribution to the reduction of dollar expenditure, he said it had sold last year 2 million gal. of motor fuel, £71,000 worth of liquid products for export and 9000 tons of mastic material, sufficient to provide substitute for softwood floors for 50,000 houses.

The chairman disclosed that two new sections of the refinery had been put to work during the last few weeks, and a third section would follow next month. Another addition to extract special and scarce phenols from effluent liquor, formerly run to waste, should be commissioned by the end of the financial year. These new sections would considerably increase refining flexibility and result in the introduction of new products.

" The intensity of research is being maintained," said Commander Buist.

STANDARDISATION

BSI Promotes Increased Output

AT the 48th annual general meeting of the British Standards Institution last week the president, Lord McGowan, referred to the greatly increased interest during the past year both by industry and Government in the extension of voluntary standardisation on a national basis.

The investigations by the committee for standardisation of engineering products under the chairmanship of Sir Ernest Lemon had substantiated the view, long held by British industry, that the principles on which the BSI works are effective and can be extended.

The Anglo-American Productivity Council had recently stressed the importance of standardisation and simplified practice, and Lord McGowan submitted that there was probably no more effective means for increasing productivity.

Another significant development during the past year had been the co-operation of the nationalised industries with the BSI and the increase in the collaboration among large industrial users with a view to assisting manufacturers to reduce the number of types and sizes.

This progressive standardisation would greatly assist the economy of the country by enabling manufacturers to introduce longer runs and better methods.

Mr. Roger Duncalfe, chairman of the institution, said that Government and industry have jointly agreed that industrial standardisation should be effected through the BSI and that " industry " included all the great professional institutions.

Sir William J. Larke, K.B.E., who has had a distinguished career in the steel industry, was elected as the new president of the institution.

New U.S. Emulsifier

A new emulsifier, S-1072, an amber coloured, viscous liquid which does not contain sulphonates, is being produced in the U.S.A. by the Glyco Products Co., Inc. It is readily soluble, cold, in orthodichlorbenzene and is therefore of interest for the manufacture of orthodichlorbenzene emulsion concentrates. The concentrate emulsifies rapidly, with little agitation, in water over a wide range of concentrations. A concentrate is made using 25-30 per cent, by volume, of the emulsifier and 70-75 per cent orthodichlorbenzene, 1 part of the concentrate is emulsified in 50-100 parts water.

Bases of the Fermentation Industries

Some Aspects of Fungal Metabolism

by J. H. BIRKINSHAW*

THE systematic investigation of the products of the micro-fungi was initiated by Wehmer who showed that oxalic and citric acid were major products of fermentation of *Aspergillus* and *Penicillium* species. The discovery of the production of citric acid laid the foundation for the fermentation citric acid industry which has nowadays become of considerable importance. Other acids of commercial value produced by the fungi are gluconic (*see page* 183 *this issue*) and itaconic acid.

These acids and a number of other simple acids of purely academic interest typify the oxidising capabilities of fungal metabolism. That the fungi are also capable of a reductive type of fermentation is shown by their production of ethyl alcohol, glycerol, and the sugar alcohols such as erythritol and mannitol.

A large number of other metabolic products of more complex structure are known, which illustrate the synthetic activities of the fungi. It is possible to select from these products certain groups which show interesting chemical relationships.

A brief review of some of the groups serves to indicate the type of pattern which is being formed by the few portions of the mosaic that have been pieced together. It is hoped that eventually these studies will throw considerable light on the mechanism of the fungal metabolic processes.

Common Denominator

The first groups to be reviewed are those on the acid citric, itaconic and succinic. The substances comprising these groups are elaborated in some cases by fungi, in other cases by lichens, which are symbionts of fungus and alga. The acids considered in these groups all show the characteristic of having long saturated carbon chains inserted as substituents in the molecule of the parent acid.

The next groups illustrated belong to the heterocyclic series but contain only carbon-oxygen rings. Examples of three, five and six membered rings are known. The tetronic acid series of fungal products forms an interesting family of closely related acids, showing only small differences in the substituents of the ring and having an obvious relationship with ascorbic acid and with penicillinic acid which has antibiotic properties.

In the aromatic series a number of phenols and phenolic acids are encountered of varying degrees of complexity. Some of these may be regarded as based on 2 : 4-dihydroxybenzoic acid, others are *p*-quinols and thus closely related to the benzoquinones, which are also found as metabolic products. It is considered probable that the quinols and their corresponding quinones, which frequently occur together, form an oxidation-reduction system which is closely concerned with respiratory processes.

Only one example of a naphthaquinone is known, but a number of hydroxyanthraquinones have been isolated from fungi. These are based on 2-methylanthraquinone and form a closely related series in which the position and number of the hydroxy-groups is the main variable. If we consider these anthraquinones as built up from phenols and phthalic acids, as in chemical synthesis, it is possible to visualise some of the simpler compounds, which occur as fungal metabolites, as possible precursors in biosynthesis.

The metabolic products so far considered contain only carbon, hydrogen and oxygen. Other common biological elements such as nitrogen, sulphur and chlorine enter into the composition of fungal products. Types of these are illustrated by the fungal antibiotics of known structure which are of proved high value in the field of chemotherapy and which are therefore of great importance in the medicinal chemical industry.

ALCOHOL FROM MOLASSES

by Dr. E. V. BELL*

DURING the period between the two wars, much scientific and technical progress has been made in the type and purity of the yeast used for molasses fermentation and in the fermentation plant employed. Specially selected strains of *Saccaromyces cerevisiae* capable of tolerating high concentrations of alcohol and possessing stable and uniform characteristics are now employed.

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* These abstracts reproduce some of the topics discussed at last week's congress by the Royal Institute of Chemistry at St Andrews on industrial permentation.

Pure culture yeast plant suitable for growing yeast, uncontaminated with other organisms, up to a sufficiently large scale for seeding industrial alcohol fermentations has been developed. The yields of alcohol and the quality have correspondingly improved.

In recent years, advances in the fermentation of molasses for alcohol have been mainly along three lines:—

1. The development of continuous fermentation processes.
2. Methods for improving the medium prior to fermentation, and
3. The "re-use of yeast" process in which the yeast is recovered at the end of fermentation and used again for many subsequent fermentations.

In the continuous processes, sterile molasses solution may be fed to a fermenter containing a pure yeast culture already developed there, according to the method of Alzola. When full, the fermenting mash is made to flow through a number of fermenters in series, so that when the mash leaves the last vessel it is completely fermented. The feed of mash to the first fermenter is continued until the yeast in the system becomes infected and degenerates. The plant is then emptied, sterilised and re-stocked with a fresh yeast culture.

According to the method of Karsch, the entire quantity of yeast in the fermentation system is circulated through two fermentation vessels in series, being recovered by means of a centrifuge from the fermented mash leaving the system and entering the grist fermenter along with fresh mash to the fermented. Other continuous processes employ systems which include a tower or column down which the mash passes in contact with yeast.

During the fermentation of molasses for alcohol production, various infecting organisms may develop. The types usually encountered are those producing acids from sugar and alcohol, an infection producing acrolein from the by-product glycerine and organisms which reduce nitrates in the mash, causing contamination of the important by-product carbon dioxide with nitrous gases. It would appear that in operating continuous fermentation processes, greater precautions against the development of infection might have been taken than are necessary with the ordinary batch type of fermentation.

During recent years several novel methods of preparing molasses mashes for alcohol fermentation have been introduced. The molasses treatment process of Arroyo is combined with a special fermentation procedure.

The yeast re-use process of the Usines de Melle is based on the suppression of the consumption of sugar for yeast proliferation, once a sufficient quantity of yeast has been developed in the fermentation system. This saving in sugar is said to result in a corresponding increase in alcohol yield.

All the yeast present in the fermented mash is recovered by centrifuging and used for subsequent fermentations. Reproduction of new yeast cells takes place only to the extent necessary to replace the small proportion of cells which die in each fermentation.

ASEPTIC TECHNIQUE

by A. PARKER *

THE fundamental principles of aseptic technique in industrial fermentation were first recognised by Pasteur and his contemporaries, but these principles have been applied, in their fullest sense, only to industrial scale fermentations which have been developed in recent years.

Most fermentations practised hitherto have exhibited some selective action, favouring the micro-organisms whose culture is desired, and tending to suppress the growth of infecting micro-organisms. The aseptic techniques used for these fermentations have only supplemented this selective action to the extent of assuring the economic success of the processes.

Consequently, the ideal of making the fermentation plant and the atmosphere and materials used in the plant the exclusive preserve of the micro-organism being cultured has arisen only with the development of processes such as the manufacture of penicillin, where it is essential to combine all the principles of aseptic technique in a system which will guarantee that conditions of pure culture are maintained through all stages of fermentation.

This is necessary because many types of bacteria, which produce an enzyme, penicillinase, capable of destroying penicillin rapidly, grow readily along with the penicillin species being used, and cause serious loss of product if they are not excluded.

This ideal may be represented by the following principles which have guided the design and operation of plant for the manufacture of penicillin on the large-scale.

(continued on page 184)

Gluconic Acid in Industry

Useful Services to Tanning, Food and Metals

by A SPECIAL CORRESPONDENT

ONLY within the last few years has gluconic acid assumed importance as an industrial chemical. Today this monocarboxylic acid derived from glucose is finding application in the mineral tanning of hides and skins, textile dyeing, the acidising of oil wells, cleaning and pickling metals, cleaning milk cans and in the manufacture of various gluconates and also glucose delta lactone.

Gluconic acid is the first oxidation product of d-glucose and is usually prepared by a fermentative oxidation of glucose. In its pure state the acid is a fine white powder with a melting point of 131° C. and a specific rotation $(\alpha)_D - 6.7$ deg. It decomposes at 180° C.

The commercial form of gluconic acid is usually a 50 per cent aqueous solution, a light yellow syrupy liquid having a specific gravity of 1.24 and possessing a very slight odour and a mildly acid taste. Although it is liquid at room temperature, the solution tends to solidfy when exposed to cold weather. In aqueous solution, gluconic acid is partially transformed into an equilibrium mixture with the gamma and delta lactones, both of which are inner anhydrides formed by the elimination of water within the molecule; the actual neutralisation value, however, of an aqueous solution behaves as if it contained pure gluconic acid.

Stabiliser

Gluconic acid forms soluble metal salts, and, what is of great interest, the presence of gluconic acid, or certain of the gluconate salts, tends to hold many metallic ions in solution even when alkaline. For many applications where it is necessary to adjust the *p*H value of soluble metallic salts by the addition of alkali, the presence of gluconic acid prevents precipitation. The following industrial applications now utilise these unique properties:—

(1) In mineral tanning using aluminium sulphate or potash alum, it is necessary to increase the *p*H value towards the end of the tanning operation by the addition of sodium bicarbonate or soda ash. The presence of gluconic acid in the tanning bath prevents precipitation and also tends to improve the quality of the leather. Claims are made that aluminium gluconate gives a more durable leather than ordinary aluminium sulphate, moreover, it increases the absorption of dyes by the mineral tanned leather.

(2) In the acidising of oil wells difficulty is often encountered due to the precipitation of iron as the acid is neutralised by the limestone. This precipitate prevents the desired flow of crude oil and defeats the object of adding acid. By adding gluconic acid to the acid, precipitation is entirely avoided.

(3) The addition of gluconic acid to electro-pickling and metal cleaning baths is claimed to give certain substantial benefits, such as longer active tub life, low acid consumptions and rapid pickling action.

(4) In metal plating this organic acid permits adjustments to the optimum *p*H without risk of precipitation.

(5) The cleaning of milk cans with ordinary commercial cleaners of an acidic type is liable to have a marked corrosive effect on the metal. To overcome the danger of corrosion the addition of gluconic acid is recommended. It possesses a low corrosion rate and also assists in the removal of dirt and of any alkaline film which might provide a medium for the action of bacteria.

In addition to the use of gluconic acid for processes where it can prevent the precipitation of metals from solutions, this acid is also claimed to be of value in textile dyeing. According to dyeing experts in the U.S.A., the use of gluconic acid improves the penetration of direct colours and ensures more even results, at the same time, there is no weakening of the fibre, a risk which is always present when strong mineral acids are employed.

The two most important gluconates are sodium gluconate and calcium gluconate. The first is a white crystalline product produced by neutralising gluconic acid with sodium carbonate or hydroxide. It is very soluble in water.

Like gluconic acid, this salt prevents the amphoteric metals, aluminium, iron, chromium, tin, and titanium, from being precipitated upon neutralisation of acidic solutions containing them. It is useful, therefore, in the plating of metals, tanning of leather and the mordanting of fabrics and weighting of silks.

Recent developments in photography have shown that sodium gluconate is a useful ingredient of certain photographic developers containing metallic salts.

Calcium gluconate has so far found its chief applications in the food and pharmaceutical industries where it is highly esteemed as a soluble form of calcium. Although it has been suggested as a retarder to the setting of plaster, cement, and similar products, no worthwhile commercial use has yet been found for it in this field.

Glucono delta lactone is a white crystalline powder with a melting point of 153° C. and a specific rotation $(\alpha)_D$ 61.7. It is formed by the removal of the elements of water from the gluconic acid molecule. Although not an acid itself, the lactone is partially hydrolysed in water into gluconic acid. So far, gluconic delta lactone finds its major use in the food and pharmaceutical industries, where its acid properties are the source of its usefulness.

BASES OF FERMENTATION INDUSTRIES

(*continued from page* 182)

1. The technique used for the preparation of starter cultures in the laboratory must ensure completely the exclusion of all contaminants.
2. The fermentation plant must be so constructed that all parts of it can be sterilised and that it encloses the culture from contact with outside contamination.
3. The air supplied to the plant cultures must be sterile.
4. The operation of the plant must be specified in such detail that relatively unskilled personnel can perform this in strict accordance with the simple sequence of actions laid down.
5. Every stage of the system of culture must be carefully checked by examination of samples for the presence of living micro-organisms other than the culture.

The way in which these principles have been applied in developing the techniques used for the manufacture of penicillin is illustrated by examples selected from the process. Methods are described by which the enclosed transfer of cultures from test tube to the final stage of the fermentation is undertaken, so that the chances of air-borne and other contamination are virtually eliminated.

It is considered that the methods of aseptic technique developed for penicillin closely approach the ideal pure culture system, but it remains to be seen whether these methods are adequate for new processes yet to be developed.

SWEDISH ANALYSIS

Estimation of Fatty and Resin Acids

FATTY and resin acids have very different esterification rates and it is therefore possible to separate them analytically. Most of the analytical methods in present use are founded on this circumstance. As none of the reaction products formed is removed, a part of the fatty acids remains unesterified. Hence the results obtained generally lack a satisfactory accuracy, states Mr. Viktor Persson in an article, the full text of which appears in Swedish in the last issue of *Svensk Pappers Tidning*.

By means of carrying out the esterification with a mixture of n-butanol and benzene it was possible to separate in a simple way the water formed and a complete conversion of the fatty acids was obtained. At the same time, however, partial esterification of the resin acids takes place. In order to reduce this as far as possible, the catalyst is used in low concentration and the temperature kept down during the treatment.

Benzene sulphonic acid turned out to be a suitable catalyst. as it is not affected by the reaction. The concentration of the catalyst being constant, a definite amount of resin acids is esterified pro time unit. Thus it is possible to introduce an exact correction for the fraction of resin acids converted during the cooking.

Sulphuric acid, on the other hand, reacts with the rest of the reaction components, and its concentration decreases successively. In order to obtain accurate values, the esterification is carried out with an oil bath, the temperature of which must not be too high.

A great number of control tests on mixtures of known composition showed the new method to give good reproducibility. Determinations according to the method as stated by CCA 15 now usually applied in Sweden, on the other hand, give too high resin contents and larger differences between double tests.

Determinations of unesterified resin acids in the reaction mixture were made titrimetrically, but in case of resin acids with varying molecular weights gravimetric methods should be applied.

Coal in Nepal

Large deposits of high-grade coal are reported to have been discovered in the Terai Valley, on the Himalayan ranges of Nepal.

SYNTHETIC SUBSTITUTE FOR PALM OIL

U.S. Innovation May Aid Tinplate Production

From OUR NEW YORK CORRESPONDENT

A TEAM of U.S. scientists, comprising W. R. Johnson, research metallurgist, L. C. Kinney, supervisor of chemical engineering, and John M. Parks, supervisor of non-ferrous metallurgy, working at the Armour Research Foundation, Chicago, Illinois, are credited with having developed a synthetic substitute for African and East Indian palm oil, a vital necessity in the making of hot-dip tinplate.

Palm oil is used to provide a bath under which the tin solidifies smoothly and without excessive impurities on the surface of the steel. Some 7500 tons of such oil are used each year in the U.S.A. for this end. The present research was supported by the American Iron and Steel Institute.

Over a period of years, the price of the oil has fluctuated widely, rising from 8 cents per lb. before the war to a wartime peak of 40 cents. Moreover, all this oil is now imported from North Africa and the East Indies over long shipping routes, and the U.S.A. is in a strategically unfavourable position in an emergency.

Common Vegetable Oils

According to the three Chicago scientists, dimerised linoleic acid (dimer acid) was selected from a large number of possible substitutes for palm oil as having the best possibilities.

The dimerised acid, separated by distillation, consists of two linked molecules of linoleic acid. It is almost entirely free fatty acid. By virtue of its molecular structure, the material has a high flash point—600°F. as compared to about 470°F. for palm oil—and a volatility about one-third that of the African product.

In making hot-dipped tinplate, sheets of pickled steel are passed through a flux into a bath of molten tin and through an 18-in. layer of hot (450°F.) palm oil. Three sets of rolls, operating in the oil, smooth and thin the tin coating. In seeking a suitable substitute for the natural product, the scientists were faced with a formidable list of requirements. For an oil to function properly in a tin pot, it must conform to at least the following characteristics:

It should make smooth, bright, good quality tinplate; drain rapidly and freely from the sheet; possess low volatility and high flash and fire points; neither oxidise nor polymerise readily; clean readily from the sheet; and be of low viscosity at 100° to 200°F. so that it may be pumped or poured readily.

A thin oil layer, if allowed to remain on the sheet, affects the final employment of the sheet. The oil has to be non-toxic, odour-free, and preferably edible; should not become rancid during storage; or interfere with lithographing, lacquering, or soldering procedures and should retard atmospheric corrosion.

British Experience Consulted

The final selection of dimerised linoleic acid was made only after extensive basic research on tinning oil action, including study of British information on the subject and the work of the British Tin Research Institute. A mill test on this material, made in a Jones and Laughlin Steel Corporation plant, was encouraging, although the dimer acid tended to increase in viscosity.

Subsequent work was devoted to a study of dimerised acid base materials, and because the acid made a good showing in the mill test, three general lines of approach to further work were followed:

Correction of undersirable viscosity characteristics of dimer acid by the use of addition agents to improve low temperature viscosity and to retard heat-bodying;

Examination of various esterified dimer acid products which are known to have satisfactory low temperature viscosity characteristics and which give promise of good resistance to heat-bodying;

Examination of certain little known materials such as Mexican jojoba oil, which on the basis of the known composition should have highly desirable properties.

The successful laboratory results thus far achieved are expected to have wide economic importance for the steel industry. The scientists believe that there is a good possibility of finding a synthetic tinning oil which will be superior to palm oil in strategic availability, performance. and cost, although such an oil may require some modification in tinning procedures and equipment.

WEATHERING OF PLASTICS

Tests Simulate Service Conditions

WITH the increasing use of laminated plastics in aircraft during the past few years, especially in accessories and semi-structural parts, the need has developed for more comprehensive information regarding the action of the weather, temperature, and humidity on the properties of these materials.

Accordingly, the U.S. National Bureau of Standards, under the sponsorship of the National Advisory Committee for Aeronautics, undertook an investigation to determine the effects of outdoor weathering, accelerated weathering, and accelerated service conditions on the weight, dimensions, and flexural properties of representative phenolic and unsaturated-polyester plastics. The test materials were commercial products, and included nine laminated plastics and a macerated-fabric-filled phenolic plastic, types commonly employed in aircraft.

Strength Increased

In most of the tests the changes in weight and superficial dimensions were negative, any positive changes being in thickness. The flexural tests revealed several cases in which increases in flexural strength resulted from the accelerated weathering and service conditions. These increases in strength were attributed to further cure of the resins. The tests were of several kinds and included one year and two years' natural exposure, and accelerated weathering by ultra-violet light (120-480 hours) and temperature cycles (70°-175°F.).

Results of the laboratory ageing tests did not in all cases correlate with the results of outdoor weathering. A laboratory evaluation procedure for a material or group of materials must therefore be selected on the basis of the materials, the properties to be determined, and the conditions which the materials will meet in service, the bureau reports.

In an accelerated service test all the materials except the asbestos-fabric phenolic laminate increased in thickness. This material was also the only one which increased in flexural strength and flexural modulus of elasticity.

The asbestos-fabric phenolic and glass-fabric unsaturated-polyester laminates were the most resistant of the materials tested. The paper-base phenolic laminates were not so stable in weight and thickness after outdoor weathering.

WELDING CONTROL

Preventing Tip Pick-up

DESIGNED to provide a gradual increase in welding current at the beginning of the weld, a new slope control for use as an accessory with either synchronous or non-synchronous resistance machines which materially reduces tip pick-up in spot welding aluminium, magnesium, and their various alloys, has just been reported in the U.S.A.

The new accessory is intended for mounting in the side of synchronous controls, or can be supplied in a separate enclosure for use with older types and non-synchronous control.

The operator's panel consists of two dials and a transfer switch. The setting of one dial, which is graduated from 3 to 13 cycles in one-cycle steps, determines the time for the welding current to reach a final value from its initially low one. The other dial, graduated in per cent of the final current, permits adjustment of the initial value of the welding current. The transfer switch facilitates disconnecting the slope control for those operations for which it is not needed.

Laboratory tests made by the General Electric Company's control division are claimed to have resulted in obtaining 20 times as many spot welds on .064-in. 24 ST Alclad aluminium, before sticking occurred, as were obtained without the control.

POLYMER CORPORATION

CAPITAL expenditure totalling $2.25 million is provided for in the 1949 budget of the Polymer Corporation, Crown-owned company, it is disclosed following the annual meeting of the board of directors, at Sarnia, Ontario, Canada. The principal item will be $1.1 million for ethane cracking furnaces, designed to double the corporation's output of ethylene and provide for increased sales to Dow Chemical of Canada, Ltd. Greater production will also enable the polymer Corporation to raise its own output of styrene.

As a result of the co-operative arrangement, certain ethane cracking furnaces, surplus to Dow's operations at Freeport, Texas, U.S.A., were made available to Polymer. This put forward by several months the date when increased supplies of ethylene would be available. Erection of the ethane cracking furnaces is already well advanced at the Polymer Corporation's plant.

Metallurgical Section

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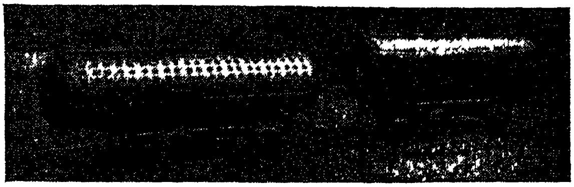

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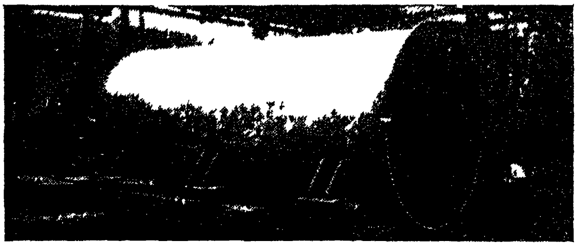

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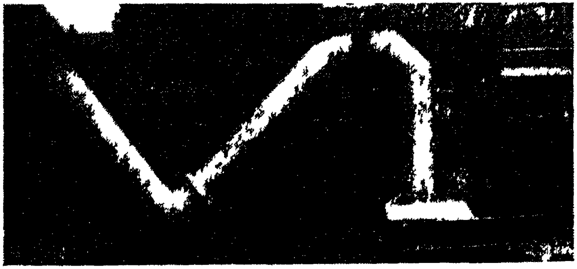

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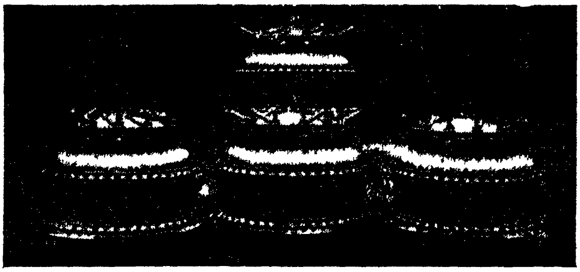

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Metallurgical Section

6 August 1949

MINING AND METALLURGY

The Economical Uses of Ores and By-Products

THE Fourth Empire Mining and Metallurgical Congress, which took place from July 9 to 23 in London, with technical sessions at Oxford and excursions around Cardiff, Cornwall, Edinburgh and Newcastle-upon-Tyne, was in every way a great success. It gave all concerned with these industries and with the development of the mineral resources of the Commonwealth an opportunity to discuss all related problems and progress. The technical papers and lectures—more than 40—were presented in the following nine sessions: Mineral resources; modern methods of prospecting, some physiological and psychological effects on workers, petroleum, coal, present-day trends in mineral dressing, metallurgy and metallurgical industries.

The following notes give extracts of a characteristic selection from the twelve papers on metallurgical industries:—

W. B. Boggs dealt with some modern developments in copper pyrometallurgy. He gave elaborate details of the chief types of furnaces now used, stressing that electricity is destined to play a very important part in the future of copper metallurgy. Dealing with roasting, converters, cathode refining furnaces and reverberatory furnaces, the paper concluded with the importance of using the proper fuels and refractories so that with various altering furnace designs an increased tonnage is smelted with diminished fuel consumption.

Last Zinc Smelters

S. W. K. Morgan outlined the development and present-day operation of the two zinc smelting plants at Avonmouth and Swansea. These are now the only representatives in this country of a once extensive industry. It is argued that the fact that they have survived is due to a readiness to adopt the most economical methods of production, coupled with attempts to make full use of every value in the incoming ore. No English ores are available and consequently all of the 170,000 tons of concentrates required annually must be imported, and bought in competion with smelters abroad. He described the new methods which the home industry has adopted for the sintering and distillation process and for the production of high purity zinc. The electrolytic zinc industry was discussed in a paper by Harry Hey, Australia.

Waste Sulphur Gases

W. S. Kirkpatrick, Canada, described the economic utilisation of waste gases by the integration of base metal and chemical fertiliser operations at Trail, B.C. Necessitated by an atmospheric pollution problem, chemical plants were constructed to deal with the waste sulphur gases from the metal-producing plants in a manner that would not add to the cost of producing metal. Actually only one of the integrations is essential—namely, the recovery of sulphur dioxide from the metallurgical plant roaster gates. All other integrations, although secondary to the principal objective, have become important to the overall operation resulting in economic gains and in some cases disposing of nuisance wastes. They have reduced or completely abolished the importance of some raw materials and have increased the efficiency and recoveries of the operations. In some cases the chief advantage has been in the increase in the capacity of equipment, thereby reducing the capital charges. These developments give support to the contention that the integration of base-metal mining and metallurgical operations with chemical fertiliser production is technically an attractive proposition.

Major C. J. P. Ball presented a paper on extraction, alloying and fabrication of magnesium. Given comparative cost of power and raw materials, the electrolytic process operated by Magnesium Electron, Ltd., can compete with United States costs, and since all the raw materials required are available in Britain, this country can produce the whole of its magnesium metal requirements if it so desires. New alloys have been developed, the improved properties of which are opening up fresh fields of usage. It has been demonstrated in practice that these alloys can be fabricated satisfactorily on steel equipment at steel speeds. It is probable that the greatly improved workability of the new zirconium-containing alloys will enable fabricating costs to be reduced so materially as to make their use more generally attractive.

Sir William Griffiths, D.Sc., gave a forecast of the nickel industry twenty years on, with reference to the by-products of nickel production. The nickel-sulphide ores of Canada have become one of the largest sources of copper in the Empire, while they are possibly the largest single source of platinum metals in the world. They provide significant quantities of gold and silver and make a useful contribution to the world's supply of cobalt. Selenium and tellurium are extracted from them, and, if present developments in the flash smelting of nickel and copper concentrates with oxygen confirm early promise, they will form an important source of liquid sulphur dioxide as well as sulphuric acid. As for nickel itself, the past twenty years have confirmed its position as one of the most useful metals available and as a prominent factor in making possible civilised life as known to-day, and during this time the world's peacetime demand has more than doubled. To meet this demand ores of lower and lower metal content have had to be utilised. The metal obtained from each ton of ore mined in 1948 was only 27 lb., as compared with 43 lb. of nickel per ton of ore in 1938.

Coinciding with the congress was an exhibition of underground machinery at Earls Court, showing a comprehensive collection of coal cutters, conveyers, power loaders, electric and compressed air drilling machines, pneumatic picks, electric equipment and a variety of accessories, of which many exhibits were running under power. The Institution of Mining and Metallurgy held in connection with the Congress a Symposium on the Refining of Non-Ferrous Metals, introduced with a lecture by Dr. C. H. Desch, F.R.S., on the effect of impurities on the properties of metals, while 19 papers dealt with the refining of non-ferrous metals.

Canada's Chemical and Metal Totals

THE upward trend in production by Canada's chemical industries was maintained in 1948 when the value (exclusive of shell-filling) reached a record total of $554 million.

The advance of $104 million over the 1947 figures, revealed by the preliminary report of the Dominion Bureau of Statistics, shows an apparent increase of 23 per cent. More than half this gain, however, was due to a change in statistical procedure, which included the vegetable oils industry among the chemical activities.

Higher output values were recorded for all industries, the percentage increases over 1947 being: Heavy chemicals, 20.6; fertilisers, 7.1; paints, 15.5; soaps, 18.2; coal tar distillation, 3.1; toilet preparations, 10.1; compressed gases, 14.8; medicinals, 0.3; polishes, 17.5; inks, 12.8; adhesives, 26.1; primary plastics, 21.5; and miscellaneous, 6.0. The vegetable oils industry gained 37.0 per cent.

Imports of chemicals and allied products in 1948 were the highest on record at $118 million, an increase of nearly 5 per cent over the previous year's total. About 90 per cent of the imports were from the United States and nearly 6 per cent from Britain.

The value of exports in 1948 was $79.8 million, a decline of about 5 per cent from 1947. Fertilisers accounted for $36.4 million, acids $5.7 million, sodium compounds $4.8 million, synthetic resins $5.2 million, calcium compounds $2.8 million, paints and pigments $6.2 million and medicinal preparations $3.1 million.

Growing Output of Base Metals

Output of metals in Canada in May this year showed a general increase, excepting nickel, which was sightly lower than in the same month of 1948, according to the Dominion Bureau of Statistics.

Production of new primary copper rose to 21,700 tons (20,700), while the total for the first five months of the year was 108,400 tons (102,300 in 1948).

May output of primary silver was 1,355,100 fine ounces, as against 1,125,600 in April and 1,072,700 in May, 1948.

Production of primary lead advanced to 17,800 tons compared with 11,300 in April and 12,700 in May last year, the cumulative total being 60,300 tons (62,100).

Production of primary zinc reached 24,800 tons, compared with 17,300 in April and 20,500 in May, 1948. For the five months output was 107,600 tons (93,300).

PHYSICAL CHEMISTRY OF IRON AND STEEL

Likely Source of Important Technical Gains

AMONG the papers presented before the recent Fourth Empire Mining and Metallurgical Congress was an important contribution by Sir Charles Goodeve, F.R.S., on " Future Trends in the British Iron and Steel Industry." In this, Sir Charles made brief reference to the researches into the physical chemistry of the steelmaking process.

The physical chemist apparently is still catching up on the art of making iron and steel, but the impact of physical chemistry in all aspects of iron and steel manufacture is likely to become substantial

In recent years there has been a great increase in knowledge of the thermodynamics of solutions of both useful and deleterious elements in liquid and solid iron. This knowledge includes the mutual effect of one solute on another, and is fundamental to the chemistry of refining, of solidification and of the formation of inclusions. It will certainly lead to ingots and sections which are purer, more consistent and better structure.

Progress in London and Glasgow

Rather more information about these researches is available in the recently published Annual Report of Council of BISRA for 1948. The chemistry department reports work undertaken by members of its Physical Chemistry Section working at Battersea, Imperial College and the Royal Technical College, Glasgow.

At Battersea, kinetic studies are continuing of the hydrogen reduction of ferrous oxide and magnetite produced by oxidation of pure iron under controlled conditions. Measurements have been made at temperatures from 900° to 200° C. and the observed overall temperature coefficient for the reduction rate is small. Initial induction periods have been obtained with FeO below about 680° C., but not with Fe_3O_4.

The conditions for movement, and the rates of movement of sulphur, between CO and CO_2 gas mixtures containing this element, and liquid iron protected by basic slags, are being investigated. The object is to determine whether considerable losses of sulphur to the furnace gases can possibly exist in the open hearth furnaces.

At Imperial College, the effect of carbon on the behaviour of sulphur has been measured, and the results published. It is very interesting to note that saturation of liquid iron with carbon halves the capacity of the metal for dissolving sulphur. The effect of high sulphur contents on the capacity to take up carbon is now under investigation.

Other thermodynamic investigations which are being pursued include the study of silicon in liquid iron, oxygen in solid iron and the conversion of oxide to sulphides. Attempts to solve the important problem of hydrogen in steel include measurement of the thermodynamics and kinetics of the absorption of hydrogen on solid iron with a view to determining under what conditions surface processes become rate controlling in the movement of hydrogen across the iron interface.

A method for the determination of dissolved oxygen by hydrogen reduction has been successfully developed and an apparatus for the determination of total oxygen by vacuum fusion is now being constructed. A rotating hearth furnace for deoxidation experiments is also under construction.

There is no doubt that, under the wise direction of Sir Charles Goodeve, the association is capable of making possible in the steel industry some most important advances in efficiency as more and more of these researches reach the stage of full application.

Electronics Exhibition

THE many and diverse applications of electronics were well illustrated at the fourth annual exhibition of the North-West section of the Institution of Electronics held at the College of Technology, Manchester, recently.

Among the variety of exhibits of interest to science and industry were devices for counting, recording, and controlling the temperature of furnaces and the speed of machines. Instruments for detecting gas in mines and metal in wood, and for measuring moisture content, pressure, viscosity, and thickness of paint are included in the range.

Two of the latest types of electron microscope and an electroencephalograph were also demonstrated.

Non-Ferrous Metal Statistics

Rising Stocks of Copper, Zinc and Lead

THE figures of production, consumption, and stocks of non-ferrous metals in the United Kingdom in June, supplied by the British Bureau of Non-Ferrous Metal Statistics, an abstract from which is published below, reveal a general increase in stocks. Closing stocks of blister copper were 578 tons more than at the end of May; those of refined copper increased by 8956 tons; unwrought zinc in concentrates by 3186 tons; slab zinc (all grades) by 14,648 tons; imported virgin lead by 12,454 tons; English refined lead by 534 tons; tin metal by 919 tons.

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	38,209	79,282
Imports	9,752	17,557
PRODUCTION:		
Primary	—	10,562
Secondary	3,280*	5,560
CONSUMPTION:	10.670	27,404
Secondary	—	13,806
Exports	4,421†	3
CLOSING STOCKS:		
Govt. and consumers' ...	38,787	88,238

* Rough copper.

† Includes 3,252 tons rough copper dispatched to Belgium and 1,157 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	26,498	long tons
Alloyed copper products	20,652	,, ,,
Copper sulphate	3,548	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	10,655	60,741
Imports	10.203	16,524
PRODUCTION:		
Virgin and remelted...	—	5,871
CONSUMPTION:		
Virgin (incl. debased)	7,017	13,645
Remelted and scrap ..	—	7,864*
Exports	-	20
CLOSING STOCKS:		
Govt. and consumers'	13,841	75,389

* Includes small quantity or zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Lead in Concentrates	Long Tons Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Other than Govt. and consumers'	48	43,160*	4 156*	—
IMPORTS	4	19,807	—	165
PRODUCTION: ...	198	—	2,777	—
CONSUMPTION: ...	199	9.269	4,681	13,346
Exports ...	—	72	—	—
CLOSING STOCKS:				
Other than Govt. and consumers'	51	55.614*	4,034*	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,762
IMPORTS	5
PRODUCTION	2,776
CONSUMPTION	1.797
EXPORTS AND RE-EXPORTS	271

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	366
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	199

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	32.50

Reviving Prospects of S. Rhodesian Platinum

RENEWED interest is reported as being displayed in the platinum deposits of Southern Rhodesia. Of nearly 80 blocks of claims registered recently in the Bulawayo district, nearly half were in respect of platinum deposits in the Belingwe area.

From time to time Rhodesia's platinum deposits have attracted considerable attention in the past, it is stated in a recent issue of *South Africa*, and investigations have been carried out in an attempt to overcome technical difficulties in the extraction of the metal and in relation to marketing it. In 1932, new discoveries concerned with the extraction of platinum renewed hopes, which had been dashed during the " boom " in 1920, for mining deposits and investigations in the Belingwe area attracted widespread interest.

The potentialities of the Belingwe deposits were thought by some to be worth some £40 million. Selukwe deposits, were estimated at double this figure.

It was estimated that the working costs then would not exceed 9s. 6d. a ton, and it was believed that Rhodesia could challenge Russia's supremacy as the world's producer of platinum. The method of extraction, however, apparently proved too expensive. Platinum is valued at about £19s. 10s. an ounce.

HARD CHROMIUM PLATING

Electrolytic Deposits on Light Alloys

by J. I. CORDWELL

HARD chromium plating, comprising a treatment of surface hardening which up to now has been employed on a wide range of steel components in recognition of the property which it confers of greatly increasing the useful working life, has had its field of application much extended during the last few years to the processing of light alloys. It has served to overcome many problems associated with the use of parts made in the light alloys, where lightness is an essential feature but where a harder surface than the alloy itself can afford is also necessary.

As hard chromium plating differs principally from ordinary chromium plating—termed decorative chromium—by the thicker coating of the electro-deposited chromium—this being of the order of 20μ to 0.1 mm. in the case of hard chromium and of the order of a few μ in the case of ordinary decorative chromium—direct technical interest attaches to the application of a thick chrome coating to the surface of components of aluminium alloy which have been previously nickel plated in an ordinary chromium plating bath.

A Satisfactory Base

The nickel deposits seemed in actual practice to be sufficiently hard for the provision of a satisfactory base for the chromium layer, capable of standing up to fairly severe treatment. In recent tests it was confirmed that the deposit of chromium on nickel flaked off even in the plating bath, and this happened whatever the type of surface preparation utilised, whenever the coating exceeded a certain thickness in the neighbourhood of 10μ. This phenomenon was due apparently to very strong internal tensions.

To follow this up, frictional tests were conducted on some trial pieces chromium plated in this manner, on which the thickness of the chromium plate approached closely to the limiting value. These tests demonstrated that, with good surface preparation, very adherent coatings could be obtained, which did not flake off during the wear test but wore away progressively.

Unfortunately, however, the resistance of the coating to rubbing and wear was still considered to be too low and did not give satisfaction as regards the object of the research. As a consequence, it was found necessary to develop a fresh process of hard chromium plating, permitting of obtaining on aluminium thick deposits of chromium ($e > 10\mu$), very adherent and possessing also a particularly high degree of hardness.

Nickel plating before applying the chromium deposit was found not to be necessary and, other deposits capable of adhering to aluminium components such as zinc, copper, etc., being too soft to support thick layers of chromium, it was decided to try to deposit the chromium directly on the aluminium without an intermediate undercoat.

Surface Preparation

The whole problem consequently resolved itself into finding a satisfactory type of surface preparation, capable of eliminating the natural layer of oxide which prevents the satisfactory adherence of the chromium deposit and at the same time to create a surface in relief favourable to the mechanical adherence of the chromium deposit.

Among the various methods proposed in the technical literature to resolve this general problem of the adherence of electrolytic deposits on the light alloys, the most promising ones appear to be those which comprise the employment of solutions of chemical stripping agents, by immersion of the light metal pieces in acid baths (HCl and HF) which can also contain a heavy metal salt (Ni, Mn). These methods are, in practice, the most simple to employ and permit the best results from the industrial point of view in the domain of electrolytic chromium deposition direct on the light alloys.

Acid Immersion Solution

Tests have shown that in the case of direct chromium plating an acid immersion solution can give good results, provided always that it has the power of exerting on the surface of the object a marked corrosive action, without being in this respect too aggressive.

On the other hand, no chemical cleaning bath can serve indiscriminately for all and every one of the light alloys. Indeed, a solution which is capable of giving excellent results for a given alloy is not capable of being applied at all to the same alloy whose structure has been modified, for example by thermal treatment.

In general, so that a cleaning bath should be capable of giving satisfaction, it is necessary that the structure of the base metal permits of a fine and regular attack on the surface, so that there are formed, during the cleaning process, numerous superficial cavities in which the electro-deposited chromium can key itself mechanically. The nature of the cleaning solution to be used will be accordingly determined by the composition and structure of the alloy that it is desired to chromium plate.

Electrolytic Couples

To favour the formation of this etched structure, proper to the keying of the deposit, it has been found necessary in every case to add to the acid bath a salt of a heavy metal, which allows the corrosive action of the acids employed to manifest itself energetically as a consequence of the formation during the cleaning of a multitude of electrolytic couples, developed by the presence of this heavy metal in the bath.

After cleaning, the surface of the metal treated is covered with a deposit more or less adherent of the metal addition contained in the bath, which it is absolutely necessary to eliminate before the chromium plating stage. This is necessary to ensure that the electrolytic deposit of chromium will be adhering strongly to the support metal in the final stage.

It will be readily conceived that the deposition can only be favourably effected on a base more or less clean. The chemical treatment utilised for this effect, in certain cases, will not be able to dissolve completely the deposit obtained by chemical displacement, but it will be found that the adherence of the chromium coating does not suffer from this.

Keying the Plating

It may be added here, that from the test results it would appear that the particles of the chemical deposit, which, after the chemical cleaning stage, remain adhering on certain alloys, in the cavities created by the etching, participate in the mechanism of the keying of the electro-deposited chromium.

Below are given details, from the practical aspect, of the method of employment and the field of utilisation of these two types of cleaning solutions which have been studied in detail and have permitted of the obtaining of good results.

The first solution is composed of nickel chloride, hydrofluoric acid, and boric acid. The quantitative composition is: $NiCl_2$ 400 gm./litre; hydrofluoric acid 2 per cent; boric acid 4 per cent.

The components leaving the degreasing bath, after a rapid rinse, are immersed in the solution heated to 25°-30°C. until the gaseous emission caused by the attack of the bath on the light alloy diminishes in intensity. The surface is then more or less uniformly covered with a deposit of nickel, which is dissolved off with a rapid rinsing in a solution of nitric acid at 36° Bé, in the cold. When the emission of hydrogen is finished, in most cases at the end of 30 sec., the components are removed from the bath, washed copiously in running water and dried before the chromium plating.

Speaking generally, this type of solution gives good results on ordinary aluminium, on alloys containing either magnesium, such as Duralinox, or else magnesium and silicon, such as Almasilium. It is not suitable, on the other hand, for the copper bearing alloys of the Duralumin type.

Porosity Holes

When a cast alloy is being processed, it is necessary to ensure that the surface of the object is not pitted with scattered porosity holes, on which the electro-deposited chromium would have a tendency to form bridges which would prevent localised adherence to the base metal. This is the reason why the best results are generally obtained on chill castings rather than on sand castings.

It will obviously always be of advantage to conduct a preliminary research to develop an appropriate pre-treatment, such as stirring, so as to divide as far as possible the impurities throughout the whole of the metal mass, and thus to obtain a fine and regular attack on the surface. It may easily be seen, for example, that the attack of the bath will be exercised much more regularly on an object in which this has been done than one which has not been handled in this way.

In the first case, the fine texture of the eutectic, in multiple areas of the surface, is favourable to the keying of the deposit, while otherwise there is a coarser distribution of the constituents in the interior of the metal which favours the formation, during the pickling stage, of large cavities in which the deposit cannot adhere.

A micrographic examination was made of an Alpax cylinder block which was chromium plated after a surface treatment of this type. The manner in which the electro-deposited chromium had adhered to the surface of the cylinder could very clearly be seen. In certain areas it had penetrated quite deeply into the interior of the metal, a feature which ensures an excellent adherence.

The second solution is composed of hydrochloric acid and of manganese sulphate. The quantitative composition is: HCl (22 Bé) 500 cc./tire; $MnSO_4$ 4 gm./litre.

The pickle cleaning is effected at 40°C. for a period of about one minute. The bath tends first of all to heat up when the component is immersed in it, then at the end of a certain period it commences to act more energetically and progressively loses its yellow coloration, following the precipitation of the manganese, and becomes a greyish colour.

The metal part treated having now become completely covered with a deposit of manganese, it should be withdrawn from the bath. The deposit of manganese is dissolved off before the chromium plating stage in a bath composed of three parts of concentrated nitric acid and one part of 50 per cent hydrofluoric acid, by a dip for a few seconds at 20°C.

Surface Corrosion

In certain cases, the nature of the composition can lead to a very marked surface corrosion. The content of HCl should then be reduced in the bath and the amount of manganese sulphate increased.

This second solution gives, when used for pickle cleaning on alloys of the Duralinox and Almasilium types, results that are not so good as the first solution previously considered, when a cast alloy is being processed, but better than when a forged, wrought or rolled alloy is being treated, such as sheets, for example. Good results are likewise obtained on ordinary aluminium but it is not suitable for the Duralumin type alloys.

The two types of solution discussed above present from the practical point of view the advantages that no toxic vapours are discharged during the processing and that no heating to a high temperature is required. They permit, in addition, of an easy control of the duration of immersion of the parts.

In order to ensure the maximum possibility of success with a procedure of surface preparation of this type before the chromium plating, too much emphasis cannot be placed on the necessity for abundant rinsing after each operation, for the corrosive solutions employed are capable of creating in several ways a bad adherence of the electro-deposited chromium if they are not completely eliminated from the base after the pickling process. Otherwise, if allowed to remain, they can upset the chromium plating bath. Also, their corrosive action can be continued in the plating electrolyte, and in this manner the deposited chromium can be separated from the base metal, leading to flaking or bad adhesion.

It must be pointed out also, however, that the rinsings should be effected with the greatest possible rapidity, so as to avoid passivation of the surface of the aluminium alloy by the formation of a fresh skin of oxide.

Composition of Electrolyte

As regards the chromium plating bath, it will be found that baths of the compositions normally employed (ratio CrO_3/SO_4 = 100 in gm. per litre) do not give satisfactory results after a surface preparation of this kind. It is necessary to use an electrolyte with a very low content of sulphuric acid. The following composition is the one that has been found to give the best results in practice: Chromic anhydride 250 gm. per litre; H_2SO_4 1.25 to 2.5 gm. per litre.

The ratio of the ions CrO_3/SO_4 being greater than 100, the deposits have a maximum adherence when they are produced at 50°-60°C. at a cathode current density equal to 40 amps. per sq. dm. The thickness of electrodeposited chromium under such conditions is of the order of 20 to 25μ per hour, and it is possible to achieve a chromium coating with a thickness of 1/10 mm. without giving rise to any flaking or peeling off of the deposit.

It is necessary to commence the metal deposition at a very high current density (60 to 80 amps. per sq. dm.), the over-voltage effect of hydrogen on aluminium being particularly low, and the starting surface also is markedly roughened.

A Chromium Cathode

The current density is reduced to normal values when the light alloy part has become covered with a thin, uniform coating of chromium, a stage which is generally reached at the end of some minutes after starting the plating. At this particular moment all the special conditions disappear, because one is then operating on what is, to all intents and purposes, a chromium cathode.

Time has not yet allowed of any detailed study being made of the behaviour in different atmospheres of chromium deposits on the light alloys, but it would appear that the direct chromium plating, with due regard to the particularly thick coating of the electrodeposited metal, constitutes a plating procedure which permits one to be particularly optimistic from this aspect. On the one hand, there is the part played by the chromium as a corrosion inhibitor as regards the aluminium, a phenomenon which is well known, and on the other hand there is the absence of any very electro-positive coatings, such as copper, between the support metal in the light alloy and the deposited chromium, which diminishes to a very great extent any risks of corrosion.

Deposits of a few microns have given, for example, a remarkably protective power to the aluminium against attack by alkalis, and it is not an over-statement to say that it is a surprising fact if one considers the high porosity of electrodeposited chromium.

One cause of corrosion which must, however, be mentioned, because it happens frequently, is the following. As the chromium plating is always conducted on a surface containing numerous cavities, the bath electrolyte can remain in the pores after the plating and create an electrochemical action between the different constituents of the base metal, which, in the long run, will obviously cause the chromium coating to part from the base metal.

Avoiding Corrosion

This type of corrosion must be specially guarded against in the processing of castings which have faults such as cracks, fissures, etc. On sound parts, the best means of avoiding this type of corrosion consists of rinsing thoroughly the parts which have been chromium plated before they are dried.

The results described above show that hard chromium plating on the light alloys is an electroplating operation that is perfectly feasible and can give very good results, provided that at all times the operations are conducted in a rational manner. The method that has been developed is characterised by the employment (a) of pickle cleaning solutions that are specially corrosive and of a type capable of creating on the alloys superficial cavities favourable to the keying of the electrodeposited chromium; (b) a chromium plating bath of which the ratio of the ions CrO_3/SO_4 is higher than in the normal decorative chromium plating baths. The plating should be conducted in this bath at a high temperature (about 55° C.) and at a high current density.

(*continued at foot of next column*)

It is probable that other methods of surface preparation would be found equally suitable before the hard chromium plating stage. As an example, microscopic examination of a section of a sample which had been chromium plated in Germany showed that the plating had been conducted on a surface which had been strongly pickled and presumably covered previously with another thin chemical deposit.

On the other hand also, anodic oxidation itself can give certain results, but ones which cannot compare in any possible manner, from the point of view of adherence of the chromium deposit, with those obtained by the chemical method described above. Microscopic examination of the structure of the keyed base of an electrodeposit on a part that had been anodically oxidised prior to plating showed that, in actual fact, there is no real bond between the plated coating and the base metal.

The deposited metal is not sufficiently anchored to the interior of the metal to allow of it resisting particularly severe stresses. This was so apparent that it was easy to detach the coating from the support metal.

There still remains quite a lot of work to be performed in the field of plated coating on the light alloys.

This subject is dealt with at length in "La Revue de l'Aluminium," Vol. 25. No 149, pp. 335-338.

CHROMISING STEEL

Improved Process Claimed

THE principles underlying the production of chrome steel surfaces on many industrial equipments are outlined in a report by Colvilles, Ltd., of Motherwell, Glasgow, of a process developed by the Metal Gas Co., Ltd. The report recalls that chromising is a chemical reaction which takes place at high temperatures on the surface of articles of ordinary steel, removing atoms of iron and replacing them with atoms of chromium.

The chromium penetrates into the steel to a depth of several thousandths of an inch to form a coating 30 per cent of protective chromium.

The stainless properties are only at the surface where they are needed, so that the total amount of chromium used is only a fraction of that required to make the articles from solid stainless steel.

An important feature of the process is that the change takes place without altering the dimensions of the article. For example, mild steel nuts and bolts can be "chromised" and will still fit easily.

Mechanical separation of the chromised coating from the articles is impossible since it is part of the article itself. It is so ductile and adherent that even the severest rolling, drawing or pressing operations do not damage it.

BORON HARDENING OF STEEL

Nature of Action in Various Alloys

AMPLIFYING the previous investigation which demonstrated that the effectiveness of boron in enhancing the hardenability of certain steels depended upon the form of the boron at the time of quenching, and not on the total amount of boron present (THE CHEMICAL AGE, 60, 358-60), the U.S. National Bureau of Standards has since extended its research to include an investigation of the hardenability of alloys and steels with particular attention to the action of the boron.

This research has shown convincingly, the Bureau states, that the action of boron in increasing the hardenability is due entirely to a solid solution effect at heat-treating temperatures.

High-purity iron-carbon alloys containing 0.3, 0.5 and 0.7 per cent carbon and other high purity alloys containing 0.4 per cent carbon and 0.7 per cent manganese, each type with and without 0.002 per cent boron, were prepared for use in this investigation. In addition, several commercial and open-hearth steels (0.4 per cent C, 1.6 per cent Mn) were included.

Test Methods

Determination of the hardenability of the alloys was made in terms of the "critical cooling rate" (i.e., the slowest rate at which the alloy or steel can be cooled and be completely hardened); the standard end-quench test was used for evaluating the same properties of the iron-carbon-manganese alloys and commercial steels.

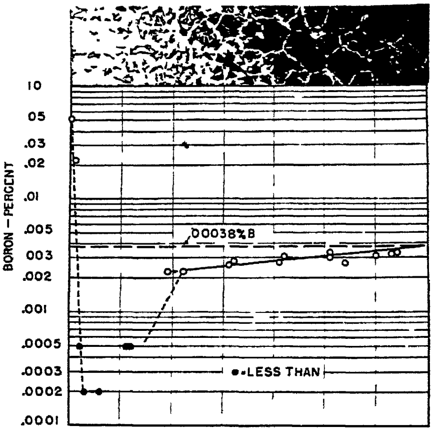
Specimens prepared from the alloys in the conditions as cast, as forged and homogenised, and as heat treated in various ways to precipitate a boron constituent were studied metallographically. Experiments were also made to determine whether boron was lost during the decarburisation of commercial steels and for determining the rate of diffusion of boron in austenite of these steels.

Small specimens of the alloys which were prepared from the ingots as cast, and also from bars after forging and homogenising, were quenched from various temperatures and a photographic record of the time-temperature relationship during the quench was obtained by means of sensitive galvanometer apparatus. The cooling time or rate so determined was correlated with the structure thus produced in the quenched specimen.

Since the hardenability of most steels is influenced by the size of the grains at the time of quenching, a determination was made of the grain size established at the quenching temperatures of each alloy and steel used in the critical cooling rate and end-quench tests. The general trend was for the hardenability of the alloys to increase (critical cooling rate decreased) as the size of the austenite grains increased.

To determine the primary effect of boron on hardenability, a comparison was made of the critical cooling rate of alloys of the same carbon content, without and with boron, when quenched from temperatures sufficiently high to ensure complete solution and uniform distribution of carbon in austenite of the same grain size.

With the forged and homogenised alloys, no significant improvement in hardenability was obtained by the addition of boron. With the alloys as cast, the hardenability was markedly improved by



Distribution of boron in a decarburised specimen of treated steel shown graphically and (top) by a photomicrograph. The left edge of the latter corresponds with the original surface of the specimen whose characteristic structure (not decarburised) is shown on the right. The graphical data was secured by spectrographic analysis at various depths. The normal boron content was .0038 per cent the addition of boron with carbon content of 0.3 or 0.5 per cent, but the presence of boron in the 0.7 per cent carbon alloy again had no material effect on its hardenability. The observed difference in hardenability could not be ascribed to a grain-size effect.

The results of the tests made on specimens initially as cast showed that the boron-treated alloys containing 0.3 and 0.5 per cent carbon had about the same hardenability and this was greater than that of the 0.7 per cent carbon alloy. Thus, the effectiveness of boron in increasing the hardenability of these alloys decreased as the carbon content increased; the improvement due to boron was very pronounced with 0.3 per cent, intermediate with 0.5 per cent, and nil with 0.7 per cent carbon.

Limiting Factors

Since boron improved the hardenability of the two alloys (0.3 and 0.5 per cent carbon) in the initial condition as cast but was practically without effect after hot-working and homogenising, it is apparent that the action of boron on hardenability was adversely affected during the course of these treatments, probably by the exposure to the relatively high forging temperature.

The action of boron in increasing the hardenability of steel is not definitely known, but tentative explanations have been reported in the literature. These theories may be classified on the basis that (1) the improvement is due to boron in solid solution in austenite, and (2) a reaction of boron with some other element to change the condition of the latter.

The Bureau's results and those published previously strongly support the conclusion that the effectiveness of boron in enhancing the hardenability of certain steels is due entirely to its action while in solid solution in austenite. Only the portion of the boron that is in solution at the time of quenching contributes towards an increase in hardenability.

The boron undissolved or in the form of compounds is either without effect, or possibly decreases hardenability by acting as transformation centres for austenite in the temperature range where pearlite is formed.

In addition to dissolving in austenite, boron can exist in steel in the form of compounds with nitrogen, oxygen, iron, and carbon. Some of these compounds are stable and are not decomposed at temperatures ordinarily used in the heat treatment of boron-treated steels. Other compounds containing boron may be partially or entirely decomposed at these temperatures.

A. This specimen (× 100) was heated to 2000°F. for three minutes, cooled to 1700°F. in a lead bath and quenched in sodium hydroxide solution. The left edge represents the original surface and the etching effect the boron constituent. B. The same specimen × 4000. C. The specimen (× 100) after reheating (1650°F. for five minutes) and quenched as before

When boron enhances the hardenability of a steel, it decreases the rate of nucleation and not the rate of growth of ferrite and carbide. The boron atom, believed to be located interstitially in the gamma iron lattice, is effective in retarding either (or both) the rate of formation of nuclei or the rate of their growth to the critical size necessary for transformation to begin.

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A Versatile Measuring Instrument

Another Practical Application of Electronic Principles

THE accurate comparison measurement or monitoring of dimensions is assuming an increasingly important function in a diversity of chemical and metallurgical operations.

A proximity meter, which eliminates physical contact with the specimen and thus avoids wear and pressure inaccuracies, has been devised by Fielden (Electronics), Ltd., Manchester.

The instrument, type PM1, may be applied to any problem which can be resolved into a minute change in electrical capacitance relative to earth. The makers point out that this change may be produced either from a minute mechanical displacement or from a change in dielectric properties.

The approach of any substance, conductor, insulator, solid or liquid, will change the capacitance of the terminating electrode, and this change is recorded on the meter.

The Set Zero control knob enables the effective electrode capacitance to be balanced to zero at any value, and the other control knob adjusts the sensitivity of the equipment over a wide range.

Highly Sensitive

A self-contained portable unit is thus provided, capable of measuring very small increments of capacity relative to earth, with an accuracy depending only on the stability of the capacity potential dividing circuit.

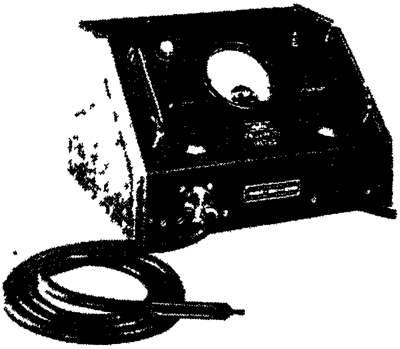
Its application to industrial problems is made possible by the special cable which enables the measurement to be made at the point where it is needed with complete stability and freedom from extraneous influences.

The physicist, the chemist or the engineer is rapidly becoming conscious of the physical, chemical and mechanical changes which can be conveniently measured as a change in electrical capacity, but unless he is a specialist in the electronics field he finds considerable difficulty in obtaining simple and stable equipment to make this measurement.

The proximity meter requires no specialised knowledge or skill for its operation.

Applications of this instrument are divided by the makers into two main fields:—

1. Where the user is dealing with conducting materials, when the instrument provides an invaluable method of dimensional comparison and measurement unsurpassed by any other means, *e.g.*, the measurement of strains in steel structures, machine tools, etc., the gauging of mass produced precision parts with greater accuracy than any other method and without wear and tear of the equipment; the monitoring of sheet metal, foil or wire sizes; the precision measurement of liquid levels (*e.g.*, a small metal band round the stem of a mercury thermometer enables a movement of 1/16 in. of the mercury column to deflect the instrument from zero to full scale).



The new proximity meter (Type PM1)

2. Where the user is dealing with non-conducting materials, the instrument may be used for dimensional control where the composition is constant, or composition control where the dimensions are constant, *e.g.*, monitoring the thickness of plastic film, determining the moisture content of powders, etc., and comparing the dielectric properties of non-conducting liquids.

Research Grant for St. Andrews

A covenant granting £2500 a year, less tax, for seven years (1949-55) to the United College of St. Andrews University was announced last week by Mr. John Rogers, deputy chairman of Imperial Chemical Industries, Ltd., on behalf of Lord McGowan and the board of I.C.I. The grant is to assist in the provision of residential facilities for post-graduate research workers and will not be confined to chemists or scientists, but will be available to all those engaged in original inquiry.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

ELOQUENT of the conversion of the search for radioactive minerals from a scientific activity to something like a national hobby is the new listing in mail-order house catalogues of a pocket Geiger counter, "the Sniffer," costing $54.50. This is a 2 lb. counter, operating on ordinary flashlight batteries and designed for general survey, monitoring, or prospecting purposes and is the newest addition to the wide variety of detecting instruments now available to uranium prospectors. It is the size of a folding camera, and is expected to replace expensive monitoring instruments in many cases where the location but not the exact strength of radiation must be determined. It is low in cost and very economical to operate, since it requires only two ordinary flashlight batteries for power, which generate 1200 volts. A growing army of amateur prospectors is seeking to capture the $10,070 reward, for each acceptable discovery of uranium deposits, offered by the U.S. Atomic Energy Commission. The instrument should also serve a useful purposed in classrooms for demonstration purposes, or in areas where formerly one expensive monitoring instrument was necessary.

* * *

Virtually the entire production of anhydrous ammonia and ammonium sulphate of the Phillips Chemical Company, Bartlesville, Oklahoma, is now available for commercial sale, according to the company's president. Having acquired the Cactus Ordnance Works, near Etter, Texas, on lease from the United States Army, in August last year, the company restored the existing anhydrous ammonia unit to its full productive capacity of approximately 230 short tons per day. A second unit is going into production shortly and by the end of August production will have been increased to a total of over 400 tons of anhydrous ammonia per day, or 120,000 tons of nitrogen per year. The company's other source of ammonium sulphate is at Port Adams on the Houston, Texas, ship canal, where operations started in January last now yield over 250,000 short tons per year of crystallised ammonium sulphate. With the additional ammonia capacity at Cactus, construction is progressing there for the manufacture of nitric acid, ammonium nitrate and nitrogen solutions.

Purified vegetable sterols in tonnage quantities are now available for the first time from Distillation Products, Inc., Rochester, New York. Refined from soya bean oil, the sterols are fine white crystals with a minimum purity of 95 per cent. They are soluble in acetone (2 gm./100 cc.), ethanol (2 gm./100 cc.), and ethyl ether (10 gm./100 cc.). They melt at 135°-138° C. and have a bromide number of approximately 500 gm./kg. In the past, the high cost of animal sterols has discouraged much research into commercial processes which would utilise the reported ability of sterols to stabilise oil-in-water and water-in-oil emulsions and to serve as raw material for the synthesis of surface-active agents, pharmaceuticals, and other chemical products. Inexpensive vegetable sterols are expected to stimulate further research in these fields.

* * *

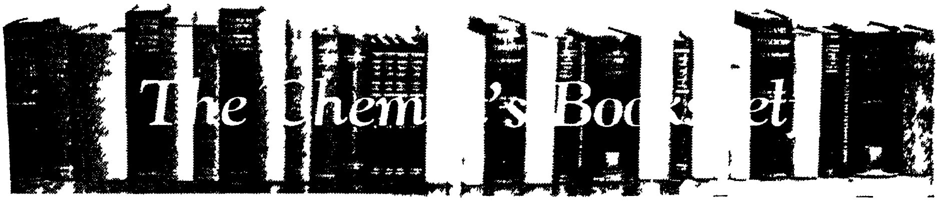
The Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., has developed an improved cleaner for reverse current cleaning of zinc base diecasting prior to electroplating. The product, known as Pennsalt Cleaner Z-54, is for use after a pre-cleaning operation, such as spray washing, emulsion cleaning, or vapour degreasing. The company claims that greater current carrying properties and use at higher temperatures combine to make it highly effective in producing chemically clean surfaces and that the process results in substantial reduction in blistering.

* * *

Monsanto Chemical Company's sales for the six months ending June 30, 1949, amounted to $79,347,108, approximately the same as the figure for the corresponding period in 1948, according to Mr. Edgar M. Queeny, chairman of the board. Net income for the first six months of 1949, after provision for preference dividends, was equivalent to $1.72 per common share. This is one cent less than for the same period last year. Sales in the second quarter of 1949 are known to have been below those of January-June, 1948.

* * *

Under a one-year agreement recently concluded, Colombia is to receive $40.000 worth of chemical products and coal-tar dyes valued at $25,000 from the Netherlands, according to the U.S. Office of International Trade.



British Standards for Steel and Steel Products. The British Standards Institution. B.S. Handbook No.10, 1949 edition. Pp.674. 25s.

National standardisation of industrial products in the United Kingdom had a beginning in 1901 with the adoption of a series of standard sections for structural steel. That fruitful start is recalled by the publication of the new handbook of the British Standards Institution, presenting in concise and comprehensive form the wide range of British standards for steel and steel products which have been registered since that time. The book consists of a number of descriptive articles which begin by outlining the principles of steelmaking, casting and forgings. There are notes on the use of steel for metal working and chemical plants and another article deals with blooms, billets, slabs and sheet bars and tabulates their qualities, chemical composition and purpose. The second part of the book summarises the various British standards which have been drawn up for the engineering and other heavy industries and explains the application of steel processes for pressure vessels, gas cylinders and galvanising. The excellent photographic and line illustrations substantially enhance the book's value to all interested in the manufacture and use of steel.

Vorraete und Verteilung der Mineralischen Rohstoffe. Dr. Felix Machatschki. 1949. Vienna: Springer-Verlag. Pp. VIII+191. 20s.

It is probably a coincidence, but a fortunate one, that the appearance of this book coincided with the Fourth Mining and Metallurgical Congress in Great Britain. It deals with world resources and distribution of mineral raw materials, not confining itself to those found in the earth's crust. Some of the materials normally of mineral origin are also found in the atmosphere and water. Their function widens with the progressive needs and technical ability of science and industry. The author distinguishes three groups of minerals: (1) Those which are practically in inexhaustible amounts in all accessible parts of the globe, like gipsum, limestone, salt, as well as the air's contribution of nitrogen and argon; (2) Raw minerals which are abundant but unequally distributed, such as coal, iron ore, bauxite, magnesite, etc.; and (3) Minerals which demand specialised exploitation, such as the ores of heavy metals, asphalt and petroleum, phosphate, asbestos, mica, etc. The book presents a wealth of information, comparable with the recent publication by the U.S. Bureau of Mines "A Glossary of the Mining and Mineral Industry." It deals in detail with supplies and distribution of numerous minerals, and supplements its findings with statistics, tables, illustrations and references.

Taschenbuch fuer Chemiker und Physiker. Edited by J. D'Ans and E. Lax. 1949. Berlin: Springer-Verlag. Pp. VIII + 1896. £2 15s.

This is a most compact and much enlarged replacement of the once very popular Chemiker Kalender. It has been compiled with the assistance of many specialists who have brought the subject matter up to date. The contents are divided into the following sections: 1, Measuring systems and syllabus of subjects; 2, General constants according to atoms and molecules; 3, Macroscopic numerical values; 4, Astrophysics, geophysics and geochemistry; 5, Characteristic properties of materials; 6, Technical measuring; 7, Analysis; and 8, Mathematical tables. All these subjects are dealt with comprehensively in terms that can be understood by anyone interested in chemistry and physics. The authors have carried out the difficult task of collecting more than 800 tables and 350 line drawings and illustrations. They have furnished the book with information which could otherwise be obtained only by reference to a small library of special subjects. The thoroughness of the compilation and the high standard of presentation have resulted in a book of reference that should be of great assistance to all concerned with the fundamentals of chemistry and physics. Its scope is indicated by the fact that the subject index runs to 48 columns.

OBITUARY

Mr. Charles Brotherton

THE death was reported last week at his home, Kirkham Abbey, near Malton, Yorks, of MR. CHARLES FREDERICK RATCLIFFE BROTHERTON, for many years head of the chemical engineering firm of Brotherton & Co., Ltd.

Mr. Brotherton, who was 67, was the son of Mr. C. F. Ratcliffe and his wife Florence, sister of Lord Brotherton, who founded the great Leeds business, and whose name he assumed in 1931. He was educated at St. Xavier College, Bruges, and at Paris and Berlin.

From the time he joined the firm in 1904 until ill health caused him to resign the chairmanship in February this year, Mr. Brotherton showed an exceptionally keen appreciation of the possibilities for a great industrial enterprise to serve social and educational interests. His vision extended beyond his immediate employees, and in 1940 he set up a trust fund of £250,000 for the advancement of education, the furtherance of medical and surgical research, and for other charitable purposes in the cities of Leeds, Birmingham, Liverpool, Wakefield, and York, and the borough of Bebington, in Cheshire—the places in which the Brotherton factories are situated. He also gave £50,000 in 1942 to Leeds General Infirmary to cover the cost of a wing for paying patients.

In 1944 Mr. Brotherton agreed to subscribe £1000 a year under deed for seven years for the establishment of a research fellowship in chemistry at Leeds University and a further £1000 a year for seven years for a lectureship in chemical engineering. He provided a further £2000 for equipment. The next year he gave to Leeds University £5000 to establish a laboratory of chemical engineering and a further £50,000 payable in the ensuing 10 years for the same purpose.

At the end of last year he contributed £1200 to enable the great East Window of York Minster to be re-leaded and replaced.

His business frequently took him abroad, and he was for years as much at home in Brazil and the Argentine as at Leeds, although he was never happier than at home in his native county.

Besides his numerous public gifts, he loved to make life easier for others and gave much away privately.

On his retirement he was succeeded by his younger brother, Captain Bertram Ratcliffe.

Personal

DR. I. M. RABINOWITCH, director of the Institute for special research and cell metabolism of the Montreal General Hospital, has been awarded $10,000 by the Sugar Research Foundation, Inc., New York, to continue his investigations on carbohydrate metabolism. The doctor, who has received $52,500 in grants from the foundation since 1946, will make a report on his studies in an address to the American Chemical Society, in Atlantic City, next month.

MR. JOHN W. STEVENS has been appointed director of sales of the chemical division of Celanese Corporation of America, to be responsible for the sales of organic chemicals produced at the Chemcel plant, Bishop, Texas.

VISCOUNT LEVERHULME, governor of Lever Brothers and Unilever, Ltd., left gross estate provisionally valued at £2,357,039, on which estate duty of £1,656,475 has been paid.

Argentine Oil Fuel

Dr. Zanetta, a director of the Argentine Government monopoly oil company "Y.P.F.", states that the country's fuel deficit will amount to 9.5 million cu. m. by 1951, in which year home requirements will total 14 million cu. m and home production no more than 4.5 million cu. m. Imports and the supplies envisaged under the treaty with the U.K. (7.2 million tons) will not be sufficient to close the gap. The further development of the Argentine oil industry is being much hampered by the lack of drilling equipment.

◆ HOME ◆

An Export Record

Record bicycle and motor cycle exports worth nearly £15 million in the first half of 1949 are £2.5 million higher than in the first half of 1948.

Cast Iron Sectional Tanks

A new British Standard (1563:1949) deals with cast iron sectional rectangular tanks for the bulk storage of liquids. Those covered by the standard are made up from 2, 3 or 4 ft. sq. unit plates bolted together, giving depths of 2, 4, 6, 8, 10 and 12 ft., with capacities from 280 to 75,000 gal. The standard offers 11 tables and four half-tone illustrations.

High Raw Materials Costs

The high prices charged by the Board of Trade for materials and the relatively low cost of manufactured paper fixed by control are stated to be the causes of the enforced closing down of the 70-year-old papermill at 296, Springfield Road, Glasgow, owned by Brown, Stewart & Co., Ltd. The firm has decided to concentrate production at the Kelvindale Mill, Glasgow, a branch of the Associated Paper Mills combine.

Steel Developments Deferred

Lord Riverdale, principal of the Sheffield steel-making firm of Arthur Balfour & Co., Ltd., said last Sunday in an interview that his company's large schemes of extension contemplated had been suspended because it was not known what was going to happen under nationalisation, although the firm was not included in the Government's steel nationalisation proposals. Smaller schemes to bring the works up to date were continuing, he said.

Census of Production

The Board of Trade announces that information is to be collected in less detail for the census of production for the year 1949 than that for the year 1948. For example, only one total figure will be required for work given out and the sections on payments for services rendered by other firms (*e.g.*, advertising, research) and an analysis of sales will be omitted. Although certain simplifications will be made for 1949, details similar to those asked for in 1948, particularly for the sections on materials purchased, and output, will be required at future censuses. Firms are therefore advised to maintain the records of their business which enabled them to complete the census forms for 1948.

New Clayton Laboratories

New laboratories are to be erected by the Clayton Aniline Co., Ltd., at Ashton New Road, Manchester.

Safety Group

Mr. Vernon Gordon and Mr. D. Brown, both of the North British Rubber Company, have been elected vice-chairman and treasurer, respectively, of the newly formed Edinburgh and South-East Scotland Industrial Safety Association, comprising workers and trade union officials.

Chemical Production Levels

The provisional index of industrial production in April and May, prepared by the Central Statistical Office, discloses that the relevant figure for chemicals and allied trades in the former month was 123, compared with 124 in the first quarter of the year and the last quarter of 1948. Production in mid-1948 was represented by the figure 115.

Hormones in Horticulture

The use of hormone-impregnated flower pots made of peat, whereby the plants derive the dual advantage of encouraged growth and undisturbed potting and expansion, has been developed in Scotland by Universal Pulp Containers, Ltd., of Milton of Campsie. These will be shown at the forthcoming Scottish Industries Exhibition in Glasgow next month.

Steel Development Continues

Government approval has been secured for a £500,000 scheme by Richard Thomas and Baldwins, Ltd., to construct at Machynis a new engineering works which will be the most modern in Wales. The plant will ultimately employ 650 people—200 more than were engaged at Nevill's Foundry, which the venture would replace.

A Widnes Memorial

A memorial to the 42 men of Imperial Chemical Industries' Widnes works who lost their lives in World War II, was unveiled by the chairman of the general chemicals division, Mr. G. K. Hampshire, in the hall of the I.C.I. Recreation Club, Liverpool Road, Widnes, on July 30. The memorial, a bronze plaque set in the hall entrance, is to 15 men of Gaskell Marsh Works, 10 of Widnes laboratory and 17 of Pilkington Sullivan works. The unveiling ceremony was performed by the Rev. G. Woodcock, vicar of Kirkdale, Liverpool, formerly senior chaplain to the 55th Division.

SULPHUR REVIVAL

2 Milliard Lire Project in Sicily

TO overcome the difficulties of the Sicilian sulphur mining industry which in 10 years have brought about a severe decrease in production and sales, the mine owners have evolved a comprehensive modernisation scheme involving the expenditure of about two milliard lire.

By utilising sulphur anhydride—which has so far been lost—for the manufacture of sulphuric acid, the mine owners hope to achieve a more economic working of the sulphur deposits. The sulphuric acid thus produced is to be the starting material for five new factories for the manufacture of chemical fertilisers and other products to be erected in Sicily at a cost of about 20 milliard lire. Special attention is to be paid to the production of superphosphate fertiliser, conditions for which are held to be particularly favourable in view of the proximity of the large North African deposits.

After re-equipment and modernisation, it is anticipated that output in the existing sulphur mines can be stepped up to over 250,000 tons per annum, which is approximately equal to the pre-war output. 20,000 men will eventually find employment in the sulphur mines, as compared with some 10,000 at present.

COPPER PROSPECTS IN ITALY

ITALY has long been grappling with problems connected with the dwindling capacity of her natural copper resources

There are a number of mines spread over the northern part of the country, but most of these have been practically exhausted, or their metal output is so poor as to make it impracticable to continue working them.

In Sardinia, where the search for copper has been energetically pursued during recent years, known ore resources have been stated to be these:—

	Estimated ore tons	Metal percentage	Total metal tons
Funtana Ramanosa (Nuoro)	200,000	2	4,000
Donas Novas (Cagliari)	250,000	4.5	11,250
Bau Arenas (Nuoro) .	30,000	5	1,500
Talentin ...	20,000	5	1,000
Barisone (Sassari) ..	20,000	5	1,000
Li Menduli (Sassari) . .	14,000	3	420

This indicates a total reserve of nearly 20,000 tons of copper which, although small by world standards, is currently a valuable asset. Plant is being erected in Sardinia for the electrometallurgic processing of the copper-bearing ore.

NEW TITANIUM SOURCES

Development in the U.S.A.

THE titanium industry in the U.S.A. in 1948 continued to establish new production and consumption records, according to the U.S. Bureau of Mines.

Since before the war the titanium picture has altered considerably. India was then supplying U.S. consumers with most of their ilmenite, the chief source of titanium. War disruption of ocean shipment, however, gave impetus to the search for alternate supplies. Now the U.S.A. has the largest single ilmenite-producing mine in the world, property of the National Lead Company at Tahawus, New York. Other new properties are in production, plan to produce in the near future, or are being investigated.

Doubtless the prospective need for nearby sources, capable of assuring large tonnages of titanium-bearing ores, anticipating the time when the metal would come into large-scale production, was a contributory factor in the development of new sources of supply.

In this connection the announcement in 1948 that the Kennecott Copper Corporation and the New Jersey Zinc Company were to exploit a very large deposit of ilmenite in Quebec, Canada, was an outstanding event of the year. (THE CHEMICAL AGE, *60*, 145).

Titanium from this property is destined for pigment purposes in the early days of production, but the operators are looking forward to an eventual large market for metal manufacture.

Foreign Suppliers

Receipts of ilmenite in 1948 fell 20 per cent below the record of the previous year. India was, as usual, by far the chief source of imported concentrates, supplying 76 per cent of the total in 1948 compared with 87 per cent in 1947. Norway supplied 17 per cent of the 1948 total, while remaining imports came from Australia, Brazil, and British Malaya. Ilmenite imports in 1948 totalled 242,119 short tons, valued at $1,758,838.

In 1948 Australia was the only country to ship rutile to the United States. Her shipments totalled 8771 short tons, valued at $588,713.

Vienna Fair

The 50th International Fair to be held in Vienna from September 11 to 18 will include a separate division for chemical and pharmaceutical preparations and a technical fair.

· OVERSEAS ·

Oil Drilling Suspended

Exploration work has recently been suspended in some of the concessions owned by foreign oil companies operating in Colombia. The quantities of oil discovered have in many cases been insufficient to warrant commercial exploitation.

Spanish Nylon

A factory is to be established in Barcelona to manufacture nylon yarn under an American licence from E.I. du Pont de Nemours & Company (U.S.A.). The large output of nylon articles in Spain at present depends upon imported yarn.

S. American Paper Projects

The Government of Argentina is to undertake extensive afforestation work intended to ensure supplies of wood-pulp for new paper mills. The Paranà pine is said to grow well in the territory of Misiones.

Fluctuating Production of Aluminium

A decline in the production of aluminium in Italy has been registered in the first quarter of this year, due chiefly to shortage of electric power. Production has now revived, in May the output having reached some 4000 tons, thus exceeding in one month the whole output of the first three months of the year.

Synthetic v. Natural Pyrethrum

The Pyrethrum Board of Kenya has stated that no adverse effects on the marketing of pyrethrum flowers in March, 1951, are expected as a result from the synthesising in the U.S.A. of the active principles of this insecticide material. The board has recommended growers to increase their 1948 acreages by 25 per cent during the coming rainy season, if labour conditions permit.

W. German Oil Refineries

Oil production in the Emsland district of Western Germany, near the Dutch frontier, has risen appreciably in recent months, states the Dutch economic daily paper *Economische Voorlichting*. Latest drillings have indicated rich occurrences of oil in the western part of Niedersachsen. As the available refinery capacity is proving insufficient for the constantly increasing crude output, plans are being considered for the erection of several large refineries, one in the Emsland and another with an annual capacity of 400,000 tons of crude at Stadersand on the lower Elbe.

French Steel Output

Production of raw steel in June totalled 767,000 tons, compared with 809,000 tons the previous month. The highest monthly output this year was attained in March—825,000 tons. Pig-iron production in June also showed a decrease, to 717,000 tons against 756,000 in May.

French Mineral Deposits

Barium oxide seams have been found in the Bidarray region (Lower Pyrenees) where, with the very pure. barytes, are minerals comprising a mixture of barium sulphate and carbonate. The presence of barytes had formerly been noted in the Drome, but has not been revealed by recent work. Exploitation of graphite shale found near Chateaubriand is about to be resumed, having been stopped at the beginning of the war. In some locations the graphite content is so high that it might be possible, with appropriate treatment, to produce a good industrial graphite.

Four More Reactors

FOUR new reactors for the controlled release of atomic energy form part of the development scheme of the U.S. Atomic Energy Commission.

Two will be commissioned and construction started within the next two years, according to Mr. Sumner T. Pike, in a recent address at Bowdoin College, Maine. The first will probably be near Arco, Idaho.

Two more would be begun in another two or three years.

The world's most advanced atomic reactor is in Canada, according to Dr. Hafstad, director of reactor development for the Atomic Energy Commission. In an address to the Institute of Aeronautical Sciences at Los Angeles, the doctor said that no greatly improved types of reactors had been built in the U.S.A. since the war.

A FORTNIGHTLY feature service for the world Press devoted to science, education and culture has been started by the United Nations Educational Scientific and Cultural Organisation. Text will be in English, French and Spanish.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

British Lignite Products, Ltd., Bovey Tracey. (M., 6/8/49.) June 29, £5000 debenture, to George Wimpey & Co., Ltd.; general charge. *Nil. December 7, 1948.

Southern Chemicals, Ltd., Dublin. (M., 30/7/49.) June 15, £25,000 debenture to the Industrial Credit Co., Ltd.; charged on the deep water quay and large store thereon beside the River Deel, Ask eaton, Lower Connelloe, Co. Limerick, also general charge. *£1000. March 26, 1948.

Southern Instruments, Ltd., Camberley, manufacturers of scientific instruments. (M., 6/8/49.) June 28, debenture, to C. Hoare & Co., London, securing all moneys due or to become due to the holders from the company; general charge. *Nil. December 31, 1944.

T. Wheeler (Scientific Instruments), Ltd., London, E.C. (M., 6/8/49.) June 30, charge, to Westminster Bank, Ltd., securing all moneys due or to become due to the bank; charged on land known as 217 Goswell Road, and 1 Goswell Terrace, E.C.1. *£300. January 26, 1949.

Satisfactions

Marsdens (Precision Tools), Ltd., Farnworth. (M.S., 6/8/49.) Satisfaction June 27, of debenture registered October 4, 1948.

Northern Oil Co., Ltd., Nottingham. (M.S., 6/7/49.) Satisfaction June 27, of debentures registered February 21, 1938.

Reynolds Scientific Glass Works, Ltd., London. S.E. (M.S., 6/8/49.) Satisfactions July 5, of mortgages registered December 19, 1947, and May 3, 1949.

Company News

The following increases in capital have been announced: E. Wood, Ltd., paint makers, from £100,000 to £150,000; Burrell & Co., Ltd., colour and varnish manufacturers, from £100,000 to £300,000, Varnicolour, Ltd., manufacturers of varnishes, oils and colours, from £100 to £2,000. Arthur Holden & Sons, Ltd., from £110,000 to £150,000.

Change of Address

The address of the directorate of Sundry Materials has been changed to Empire House, St. Martins-le-Grand, E.C.1.

Texas City Action

THE disastrous explosion which laid waste a large part of Texas City following a fire in two fertiliser ships two years ago (The Chemical Age, *56*, 497), is recalled by the slow progress of the $200 million law suit against the United States Government, which is in session at Houston and Galveston. The testimony is voluminous and it seems that several months will elapse before the concluding evidence can be presented. This court action deals solely with the liability of the United States Government in the inspection of the loading of ammonium nitrate. No evidence has been presented in connection with tests that were made after April 16-17, 1947.

Abuse of "C" Licences Denied

The "C" licence has been "the target for a great deal of comment, much of it from sources apparently not well-informed," says the annual report of the London and Home Counties Area of the Traders' Road Transport Association, the national organisation for C licence-holders. "This serves to stress the necessity for the greatest vigilance to ensure that all steps necessary to uphold the interests of the C licence-holders are taken," it says.

"Earlier in the year there was some revival of charges of illegal operation by C licence-holders, and in publicly stating its belief that there was no serious degree of illegal operation, the association offered to investigate fully any cases brought to its notice. The insignificant response to the offer confirmed that there was no substance in the allegations."

The Stock and Chemical Markets

THE heavy fall in British Funds has continued to overshadow stock markets where some uneasiness is associated with the belief that the Government will have to take more steps in September to prevent further big drains on gold and dollar reserves. At the time of writing, gilt-edged stocks have made no recovery from the heavy falls of last week, but industrial shares are steadier. Prices are inclined to move sharply on only moderate buying or selling.

Chemical and kindred shares reflected the general trend, but were mostly lower on balance. Thus Imperial Chemical were 42s. 3d., Fisons 44s., and Albright & Wilsons 28s. Monsanto, however, have been maintained at 51s. 3d. British Glues & Chemicals 4s. ordinary eased to 18s. 6d., and Boake Roberts 5s. shares were lower at 29s. on the reduced profits, although the dividend is again 30 per cent. Elsewhere, W. J. Bush ordinary shares remained firmly held and quoted at 77s. 6d. on the financial results and higher distribution of 14½ per cent (comparing with 12 per cent for the previous year).

Lever & Unilever have been steadier around 42s. 6d. with Lever N.V. at 43s. 3d.; Dunlops were uncertain at 60s. 3d., Turner & Newall 73s., and General Refractories 23s. 4½d. Borax Consolidated have been steadier at 50s., also British Aluminium at 48s., British Oxygen at 92s. 6d., and Triplex Glass 10s. shares at 20s. were within a few pence of the level a week ago.

Despite market expectations of an eventual bonus, Glaxo Laboratories at £17½ were lower on balance. Boots Drug were slightly down at 47s. 9d., and British Drug Houses 5s. shares 7s. 3d. United Molasses (38s. 3d.) were inclined to attract attention, following their recent fall, in recognition of the fact that the company is a substantial dollar earner. British Match have been steady at 32s. 3d. and there was again a firmer tendency in shares of companies connected with plastics, although De La Rue at 26s. 6d. attracted profit-taking and receded from the high level created by the good financial results. British Xylonite were 65s., British Industrial Plastics 2s. shares 4s. 10½d., and Kleeman 10s. 3d.

In iron and steels Firth Brown were weak at 68s. 1½d. Dorman Long were 28s. 6d., United Steel 26s. 6d., and Stewarts & Lloyds 53s. 3d. Whitehead Iron, however, rallied to 111s. 3d. Elsewhere, Guest Keen receded to 36s. 3d., Babcock & Wilcox 56s. 3d., and Staveley 76s. 6d.

There has been a better tendency in Beechams deferred at 12s. 6d., Sangers were 29s., and Griffiths Hughes 18s. 1½d. Ilford 5s. ordinary were firm at 21s., and Laporte Chemicals 5s. shares kept firm at 21s. 3d., while Amber Chemical 2s. shares were 5s. 7½d., and Bowmans Chemicals 7s. General Electric, however, came back to 81s. 6d. on the financial results. There was only a very small business in oil shares and, with sellers predominating, prices moved lower.

Market Reports

ACTIVITY on the industrial chemicals market has been somewhat subdued during the past week due, no doubt, to the influence of holidays. Buyers, moreover, are showing a tendency to limit themselves to short-term period buying. There is no lack of interest in the soda products section and potash chemicals continue firm. Owing to an increase in the price of pig lead, the prices for white lead and red lead have been advanced to £112 5s. per ton and £102 per ton respectively. The coal tar products market remains unchanged, with a fairly good demand reported for pitch and naphthalene.

MANCHESTER.—Trading, so far as new bookings are concerned, has been quieter on the Manchester chemical market during the past week. This is attributable largely, although not entirely, to holiday influences. Another factor which tends to restrict dealings in one or two lines is uncertainty regarding prices, the effect being to limit fresh transactions as far as possible to early needs. Actual movements into consumption, allowing for seasonal influences, keep up fairly well.

GLASGOW.—The Scottish chemical market has continued to operate on a diminished scale, but order books for delivery after the holidays have been well filled. No unusual demands have been noted. Indications are that the turnover will gradually rise during the next two or three weeks to the previous level, as most of the larger users of chemicals are fairly busy; a reasonably satisfactory volume of business may be expected. There has been a steady increase in the local demand for various grades of toluene over the past few months, and it seems likely that this will continue.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each Higher priced photostat copies are generally available.

Complete Specifications Accepted

Chlorinated polymers.—E. I. Du Pont de Nemours & Co. May 17, 1946. 623,705.

Process for the preparation of steel of high quality.—C. Coli. Dec. 9, 1940. 624,165.

Methods of improving permanent magnet alloys.—British Thomson-Houston Co., Ltd. July 29, 1943. 624,166.

Process of and apparatus for the manufacture of phosphate fertilisers.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques des St.-Gobain, Chauny & Cirey. March 6, 1942. 623,989.

Process for the dehydration of acetic acid and other lower fatty acids.—D. F. Othmer. Feb. 17, 1941. 623,991.

Liquid vinyl resin dispersion process and product.—H. J. Fitzpatrick (Advance Solvents & Chemical Corporation). Dec. 22, 1945. 624,079.

Textile products.—Imperial Chemical Industries, Ltd., and A. H. Little. Feb. 15, 1946. 623,805.

Froth flotation process and flotation agents therefor.—National Chemical Products, Ltd., and R. F. Powell. Feb. 21, 1946. 623,994.

Cellular glass and the formation therefor.—Pittsburgh Corning Corporation. April 24, 1945. 623,806.

Glass mixtures and process of forming same.—Pittsburgh Corning Corporation. April 26, 1945. 623,807.

Cellular glass and process of forming same.—Pittsburgh Corning Corporation. April 24, 1945. 623,808.

Manufacture of articles of thermoplastic synthetic resins.—S.P.A. Lavorazione Materie Plastiche. June 21, 1944. 624,174.

Preparation of N-(pyrimido (4.5-b) pyrazemethyl) amino-phenyl compounds and intermediates thereof.—American Cyanamid Co. . Jan. 15, 1946. (Cognate Application 13182/46.) 623,809.

Manufacture of organo-silicon compounds.—Corning Glass Works. Nov. 15, 1945. 624,086.

Preparation of emulsions of polymeric organic polysulphides.—B. F. Goodrich Co. June 13, 1945. (Cognate Application 15534/46.) 623.996.

Insecticidal compositions. — Hercules Powder Co. Aug. 4, 1945. 624,176.

Manufacture of dyestuff intermediates of the anthraquinone series. — Imperial Chemical Industries, Ltd., S. Coffey, F. Lodge and J. Wardleworth. May 27, 1946. 623,997.

Manufacture of dyestuff intermediates of the dibenzanthrone and isodibenzanthrone series. — Imperial Chemical Industries, Ltd., S. Coffey, F. Lodge and J. Wardleworth. May 27, 1946. 623,998.

Means for controlling the mixing of hot and cold fluids.—Walker Crosweller & Co., Ltd., and C. L. Barker. July 11, 1946. (Cognate Application 11209/47.) 623,811.

Electric furnaces for the manufacture of glass, or the like.—J. Finger. July 23, 1946. 624,002.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond and R. J. Wigginton. Aug. 16, 1946. 623,813.

Production of solutions of organic bases. —Permutit Co., Ltd., and W. G. Prescott. Aug. 16, 1946. 624,008.

Thermostatic mixers for liquids. — R. E. L. Trubert. June 2, 1942. 623,814.

Catalysts for use in the synthesis of hydrocarbons.—J. C. Arnold (Standard Oil Development Co.). Aug. 23, 1946. 623,815.

Preparation of polychloroprene cements. —E. I. Du Pont de Nemours & Co. Sept. 15, 1945. 624,012.

Manufacture of amines and quaternary ammonium salts.—Ciba, Ltd. Oct. 4, 1945. (Cognate Application 28557/46.) 624,101.

Method and apparatus for magnetic separation of very fine pulverulent products.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Oct. 12, 1945. 624,103.

Crystallising potassium phosphate.—Standard Telephones & Cables, Ltd. July 31, 1945. 624,105.

Manufacture of penicillin and other antibiotic products. — Carbonisation et Charbons Actifs. Nov. 14, 1945. 624,108.

Alkyl esters of alpha-beta unsaturated carboxylic acids and method of preparing same.—B. F. Goodrich Co. Nov. 28, 1945. 624,015.

Manufacture of tertiary and quaternary trisubstituted acetic acid amino-alkyl esters.—Ciba, Ltd. Nov. 2, 1945. (Cognate Application 32553/46.) 624,016.

The
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New Fields for Science

ONE of the factors contributing significantly to the prevailing shortage of scientific workers has been the constantly increased demand for their services in British countries overseas. The sciences have played a decisive part in the development of these territories since the pioneer era, but their field has until recently been a limited one. Their aid was needed above all else for the promotion of health services to make many vast and relatively little developed areas fit for men to live and work in. That honourable service continues on a wider scale than ever before and promises to be indispensable as long as any contemporary estimate can foresee. Yet it has already so improved the prospects of profitable development of some areas of the earth as to change entirely the needs of those places from "bush equipment" to the kind of scientific and technological services employed in highly developed agricultural and industrial communities.

Nothing could be more encouraging, from the viewpoint of the young science worker or technologist in training now, than the multiplying evidences that there will be awaiting him work on a scale larger than ever before as soon as he is fully qualified to undertake it. The attractiveness of the prospect is thrown into sharper focus by the knowledge that his is a "sellers' market." He is wanted here, while around the earth are opening up fields in which his skill and knowledge may be indispensable if great schemes now being shaped in Africa and elsewhere are to come to fruition. A glimpse of this situation is afforded in the current second annual report of the Colonial Insecticides Committee, of the Colonial Research Council which, incidentally, is in the present context concerned chiefly with Africa, and consequently does not pretend to tell the whole story. "There is a grave shortage of trained scientific personnel for employment in insecticide research in the Colonies," reports this committee. "The committee has recommended that to meet the situation the award should be made of six studentships to young graduates, for training in insecticides research in the United Kingdom, preparatory to taking up employment with the insecticide teams in the Colonies." With the same object in view, the two Beit scholarships to be offered shortly to Southern Rhodesians will be integrated with the work of the Colonial Insecticides Research Unit in East Africa.

Measures such as these, however, touch only the fringe of the needs, of which this report provides some reflections. How urgent they are

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becomes evident in the light of the fact that it has been found necessary to enlist the help of American research workers to grapple with some of the pest control work which is calling for immediate action in Africa. The ECA has approved that proposal and will pay out of ERP funds part of the cost of maintaining the U.S. scientists while they collaborate with British workers already devoted to the task of limiting the destruction wrought by trypanosomiasis, malaria and insect-borne diseases in Africa. That there is no lack of cordiality and readiness to collaborate with the Insecticides Committee is manifest in this and other directions, but from none is there any prospect of providing science workers in anything like the number the scope of the work in the insect war alone will require. The conquest of the mosquito or tsetse fly with chemical weapons is not achieved by workers in the marsh or scrublands alone. The size of the contribution which is to come from the laboratory workers was attested most convincingly when the first facts about Antrycide were made public. The Insecticides Committee is, of course, very well aware of this need and has drawn attention to the grave lack of fundamental data to ensure the proper use on the new widened scale of insecticides in the public health, agricultural and veterinary fields. To provide more knowledge on which the field entomologist can base his experiments the committee has now set up—not without difficulties and delays—a research station at Porton, near Salisbury, devoted to Colonial problems, to study such factors as the effect of crystal and particle size upon toxicity.

All these enterprises call for manpower on a scale which existing training facilities certainly cannot fully supply, but the relatively small army in the field has powerful allies and well wishers. The makers of insecticides continue their indispensable work in fundamental and practical spheres and the South African Air Force has made possible much useful experimentation in Swaziland in the aerial dispersion of insecticidal smokes. In that field of activities, it is interesting to note, the Swaziland Government, after purchasing from Imperial Chemical Industries, Ltd., 12,000 ground smoke generators to

(*continued on page* 210)

Notes and Comments

The New Industries

THE difficulties associated with the setting up of new industries, contrasted with the more familiar practice of expanding an existing technique into new fields have evidently been experienced in many stages of the younger enterprises based on petroleum. While many of the synthesis products of petroleum are now coming to the user industries in commercial quantities from the installations in the North-West, the field awaiting development when plant and refinery capacities permit is a great deal larger than that which the petroleum conversion specialists can now call their own. Such news as there has been about the new carbon black enterprises at Avonmouth and Merseyside does not encourage expectations that they will greatly outpace their predecessors in the petroleum field in the rate of their development, although their technical problems are somewhat less complex. Present indications are that our dependence upon the U.S.A. will not be relieved by home supplies of carbon black before another 12 months have elapsed.

By-Product Heat

WHILE few facts are to be had at this stage, there is some gratification to be derived from the knowledge that the British carbon black plants will be technically as advanced as any, and substantially more efficient than some set up in the U.S.A. when oilfield gases were regarded of little value and often were burned to waste. It is worth noting, for example, that the Avonmouth plant on which Philblack, Ltd., is now working will be practically 100 per cent efficient, so far as carbon black yield is concerned. In some American plants recovery of 16 per cent of carbon content of the hydrocarbons used to be regarded as adequate. The conspicuous problem in any such carbon recovery plant here is likely to be to make the most profitable use of the heat generated. In the older plants based on the incomplete combustion of hydrocarbon gases in air temperatures of around 2000°F were usual. It can be assumed that thermal values in the new British plants will be approximately of the same order, so that their economical uses, in addition to preheating the oil gases, must present stimulating scope for enterprise by commercial engineers.

Liaison with Industry

EDINBURGH University, foremost in its appreciation of universities' power and responsibility to promote progress in industry, has found a vice-chancellor better qualified than any to give practical expression to its philosophy in Sir Edward Appleton, former secretary of the DSIR. This emerges very clearly in the foreword he has written for the publication issued by the university's Industrial Liaison Committee to explain to industrialists the creed of interdependence of the fundamental and the practical. He says that the history of science is full of examples of the surprising way in which fundamental research has yielded results of importance to technology and industry. Practical developments equally were capable of affording new tools and techniques to the fundamental research worker. The old distinction and antagonism between pure and applied science was never justifiable and now was fast disappearing. "I do not feel that a university can achieve its whole purpose if its members are content to live a cloistered life of detachment, impervious to what is happening in the world outside," he declares. "In this volume, we university workers in departments most closely associated with industrial interests try to describe ourselves—who we are and what we are trying to do." Twenty departments are introduced and depicted with a refreshing absence of formality.

International Exchanges

THE interdependence of chemists, irrespective of the conflicts of national objectives and philosophies, and their need to collaborate will be acknowledged again in Amsterdam next month, when workers from all the countries in which some degree of freedom is possible in scientific affairs will hold the XVth Conference of the International Union of Chemistry. How chequered has been the course of international collaboration is recalled by Prof. Marston T. Bogert in the course of the Charles Frederick Chandler Lectures given earlier this year at the Columbia University, New York (*Chemical and Engineering News*, 1949, *28*, 1992-95). Prof. Bogert, whom chemists here had the privilege of meeting when he presided over the XIVth congress of the International Union in London in 1947, has rendered further important service to international collaboration by recalling the various stages in the long struggle by chemists to set up and preserve their ideal of identity of objectives. The story, which Prof. Bogert has invested with life again, is shown by him to have begun, in this particular context, towards the end of 1859, with the initiative of Kerkulé, which resulted in the gathering in Karlsruhe during September 5-9, 1860, of one of the most distinguished assemblies of international chemists. Its original purpose was to clear up the extreme confusion in chemical symbolism then in use which, Prof. Bogert recalls, encouraged chemists to represent even water either as HO, H_2O or H_2O_2. How much more it did is revealed in one passage written later by Mendeléev: "The decisive moment in the development of my idea concerning the periodic law I consider to be the year 1860, and the congress of chemists in Karlsruhe in which I took part, particularly the ideas presented during that meeting by the Italian chemist Stanislao Cannizzaro."

NEW FIELDS FOR SCIENCE
(continued from page 208)

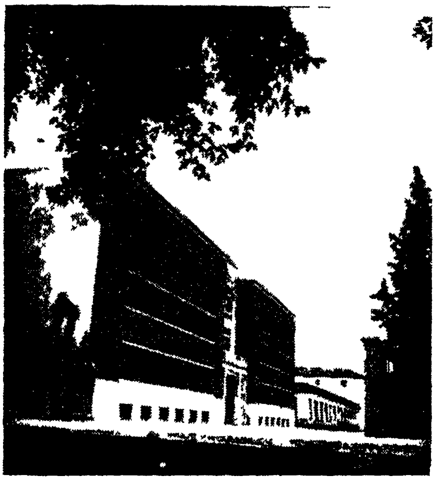
kill tsetse fly, was presented with a further 12,000 free of charge. That appears to be typical of the cordial relationship between the official agencies and commercial undertakings which are together finding new chemical formulations and new uses to free many parts of the Commonwealth from the pests which have for generations forbidden their full use for agriculture, mining and industry. The successful conclusion of that campaign in any area (in Cyprus the Anophelene mosquito has already been eradicated) is likely to be the starting point of another, infinitely wider in its objectives for development, in which scientists and technologists will have to play no less intimate a part.

The British Press in Turkey

ANY country's prestige and understanding overseas cannot fail to depend to a large extent upon the quality and number of its journals, reviews and magazines, whether they are technical, literary, fictional, artistic, or statistical. It is therefore anything but good news to learn from the monthly trade journal of the British Chamber of Commerce of Turkey (July) that although there exists in Turkey a very lively willingness to know more about Great Britain, English periodicals have tended to disappear from the kiosks and bookshops in Istanbul, driven out by American publications. Several considerations have caused this—the higher cost of production in England and the refusal of English publishers to accept the return of unsold copies and the abundance of reading matter U.S. journals, unacquainted with paper shortage, are able to offer. This decline of English periodicals abroad has another serious aspect, for it can only have an adverse affect on our trade. It is interesting that one journal, which publishes a supplement every other month in the language of the country, has held its own in the Turkish market. This is *Britanya Sanayii*, published by our contemporary THE BRITISH TRADE JOURNAL. We take a justifiable pride in the fact that THE CHEMICAL AGE, too, has managed to increase the number of its subscribers each year since 1946.

GLAXO INCREASES SCOPE IN ITALY

New Model Plant in Verona



The pleasing front elevation of the new building in Verona

A BRITISH enterprise, Glaxo Laboratories, Ltd., now possesses what is considered to be the most advanced plant for the production of pharmaceutical chemicals in Italy. This position was established by the opening at Verona on July 30 of the entirely reconstructed plant of S.A.I. Laboratori Glaxo, the Italian subsidiary which had its inception in 1929.

The ceremony, forming part of the Verona Medical Congress, which concluded on July 31, was distinguished by the attendance of 500 Italian doctors and the British Consul General in Milan (Mr. R. C. Goldie). Earlier, the plant was visited by Sir Alexander Fleming and Prof. Mario Cotellessa, Italian High Commisioner for Hygiene and Public Health.

The new premises consist of a modern four-storey L-shaped building with a frontage of 174 ft. and a depth of 115 ft. The new plant has been built around the old which now becomes a small and unrecognisable part of the production area. The exterior of the factory is in smooth red bricks with a plinth of rough worked grey-pink stone. On the first floor, immediately above an archway which symmetrically divides the frontage, are the board room and factory offices, and on the second are the library and conference room.

The most advanced section of the factory itself, which shares the frontage with the office suite and occupies a further wing running at right angles into the courtyard, is the ampoule department. Ampoule washing, cutting and filling, as well as the preparation of sterile solutions, is carried out in large well-lighted, air-conditioned rooms, with gas, compressed air, vacuum and nitrogen piped to the benches and machines. The air conditioning system is of a very advanced kind.

The Minadex plant possesses several modern features. Occupying three floors, it comprises all-stainless components connected with resistance glass pipes. Raw materials ascend to the required level, and intermediate solutions and the finished products descend by gravity. The staff of the new factory comprises several hundred.

EFFECTIVE PEST REPELLANT

A NEW chemical treatment, employing pyrethrins or a mixture of pyrethrins and piperonyl butoxide, which is claimed successfully to keep insects from penetrating cotton bags containing stored flour, has been discovered by two U.S. Government scientists, Drs. Richard T. Cotton, of the Bureau of Entomology and Plant Quarantine, Manhattan, Kansas, and Winston B. Strickland, of the Southern Regional Research Laboratory in New Orleans, Louisiana. Laboratory tests are reported to have shown that the common flour insects, in seven months, penetrated none of the treated bags, while one untreated bag admitted 563 of the insects.

Baking tests have indicated that the quality of flour stored in bags so treated is not affected.

In experiments to determine the effectiveness of the chemicals in different concentrations, the scientists found that 10 mg. of pyrethrins, alone or mixed with 100 mg. of piperonyl butoxide, per sq. ft. of cloth gave protection from such insects as flour beetles, the cadelle, Mediterranean flour moth, lesser grain borer, and others which are able to penetrate or to deposit their eggs through the fabrics of untreated bags. Protection was also obtained when bags were made of cloth woven from treated warp yarns and untreated filling yarns.

Sulphuric Acid Statistics

Small Use and Output in the Second Quarter

A SLIGHT fairly general decrease in production and consumption of sulphuric acid and oleum in the second quarter of this year is shown in the classified summary issued by the National Sulphuric Acid Association, Ltd. The comparison is with the January to March quarter.

Comparative figures, with the first quarter totals shown in brackets, are:—Production 427,229 tons, representing 94.0 per cent of total capacity (442,651 tons = 94.5 per cent). Consumption: dyestuffs and intermediates, 17,046 tons (19,906); hydrochloric acid 15,775 tons (16,007); iron pickling, including tin plate, 22,505 tons (23,853); rayon and transparent paper, 39,401 tons (44,718); sulphate of ammonia, 62,386 tons (65,251): superphosphates, 130,329 tons (142,709). Of the few consumption items which showed an increase on the quarter, the principal are: Mineral oil refining 14,476 tons (11,943), and paint and lithopone 27,406 tons (23.644).

SULPHURIC ACID AND OLEUM
Tons of 100% H_2SO_4

	Chamber only	Contact only	Chamber and Contact
Stock, April 1, 1949	30.754	23,051	53,805
Production ...	197,317	229,912	427,229
Receipts	44.252	12,398	56,650
Oleum feed ...	—	2,397	2.397
Adjustments ...	−66	−126	+60
Use	125,058	81,162	206,220
Despatches ...	113.613	157,887	271,500
Stock June 30, 1949	33,586	28,835	62.421
Total capacity represented ...	213,130	241.560	454,690
Percentage production	92.6%	95.2%	94.0%

RAW MATERIALS
Tons

	Pyrites*	Spent Oxide	Sulphur and H_2S	Zinc Concentrates
Stock, April 1, 1949	74,473	169,171	60,228	15.220
Receipts	90.506	55,110	90,059	32,664
Adjustments ...	−384	−1,128	−382	+80
Use	89.260	48,621	74,220	36,714
Despatches ...	2 23†	4.649 108†	79	—
Stock, June 30, 1949	75,310	172.031	75,606	11,250

* "Receipts" and "Use" include anhydrite "converted" to pyrites.

† Used at works for purposes other than sulphuric acid manufacture.

CONSUMPTION OF SULPHURIC ACID AND OLEUM
UNITED KINGDOM AND EIRE

	Tons 100% H_2SO_4
Accumulators	2,197
Agricultural purposes	1,736
Bichromate and chromic acid	2,909
Borax and boracic acid ("Unclassified") ...	
Bromine	2,941
Chlorsulphonic acid ("Unclassified")	
Clays (Fuller's earth, etc.)	2,048
Copper pickling	666
Dealers	4,267
Drugs and fine chemicals	2,552
Dyestuffs and intermediates	17,046
Explosives	2,884
Export	804
Formic acid ("Unclassified")	
Glue, gelatine and size	536
Hydrochloric acid	15,795
Hydrofluoric acid ("Unclassified"	
Iron pickling (incl. tin plate)	22,505
Leather	1,536
Metal extraction	556
Oil (mineral), refining	14,476
Oil (vegetable), refining	2,601
Oxalic, tartaric and citric acids ("Unclassified")	
Paint and lithopone	27,406
Paper, etc.	1,089
Phosphates (industrial)	1,314
Plastics, not otherwise classified	3,919
Rare earths ("Unclassified")	
Rayon and Transparent Paper	39,401
Sewage	2,744
Soap and glycerine	1,524
Sugar refining	163
Sulphate of alumina ("Unclassified") ...	
Sulphate of ammonia	62,386
Sulphate of barium	1,287
Sulphate of copper	5,313
Sulphate of magnesium	1,478
Sulphate of zinc	805
Superphosphates	130,329
Tar and benzol	4,383
Textiles Uses	5,872
Unclassified—Uses known	23,598
Uses unknown	11,010
Total	422,076

Fertilisers in U.S.A.

THE prospects for material supplies during the coming fertiliser year were reviewed by Mr. Ray King, chairman of the board of directors of the U.S. National Fertiliser Association, at its recent 24th annual convention. He estimated that, due to increased production capacities and changes in nitrogen-allocation programme, fully 220,000 tons of additional nitrogen will be available for use in the 1949-50 crop-planting year, an increase of 28 per cent over the year before. The amount exported will probably be lower because of discontinuance of the FAO allocation programme and of army exports to Europe.

JULY STEEL OUTPUT

Possibility of Overproduction Foreseen

DESPITE the normal reduction due to holidays in the industry, production of steel in July reached an annual rate of 12.695 million tons, compared with a yearly rate of 12.084 million tons in July 1948.

So far the output of steel for the seven months to the end of July has exceeded by 431,000 tons the previous record levels attained last year.

Even when allowance is made for the seasonal reduction in production in July and August, states the Iron and Steel Federation, there is good reason to believe that the estimated output of 15¼-15½ million tons made in the Economic Survey will be reached.

Pig iron produced during the month was at the rate of 9,224,000 tons—an increase of 316,000 tons compared with July, 1948. A short analysis of iron and steel output since the beginning of the year is as follows:—

Steel Ingots and Castings
(000's of tons)

	1949		1948	
	Weekly average	Annual rate	Weekly average	Annual rate
First quarter .	305	15,850	287	14,933
Second quarter ...	307	15,944	295	15,325
July	244	12,695	232	12,084

Pig Iron

	1949		1948	
	Weekly average	Annual rate	Weekly average	Annual rate
First quarter ...	179	9,324	175	9,084
Second quarter ...	184	9,559	182	9,464
July	177	9,224	171	8,908

Doubts as to the advisability of continuing schemes for further expansion of the industry were expressed last week by Sheffield steelmakers.

A falling-off in demand has already been experienced, and a first-hand study of the steel position in this country, Canada, and the U.S.A., has caused leaders of the industry to believe that, in view of uncertainty of the market, there is now a real danger of over-production.

Sheffield's Master Cutler, Lt.-Col. J. P. Hunt, is reported by *The Times* to have stated that caution is necessary as German steel products are now coming to England and that Japan will soon be reappearing as a steel producer.

Indications that this view is not unanimously held are shown by the announcement by Dorman Long that the second stage of its development scheme is to be put in hand immediately.

£8 m. STEEL PLAN

Development by Dorman Long

THE second stage of the development scheme of Dorman Long & Co., Ltd., is to be put in hand immediately, involving a further capital expenditure of £8 million. It will include the building of an open hearth steel plant at Lackenby, with a capacity of 10,000 tons of ingots per week, extension of the new ore grading plant at the Cleveland works and new blast furnace ancillary equipment.

Three Years to Complete

The Lackenby plant will feed the new universal beam mill, which is the third stage of the company's plan. Output of the new blast-furnaces scheduled for installation at the Cleveland works is estimated at 7,250-7,500 tons of basic iron per week. It is anticipated that all this work can be completed by September, 1952.

The first stage of the company's development programme was the installation of central ore unloading equipment and ore preparation plant at the Cleveland works, and a private railway line over three miles in length linking the Cleveland and Redcar works. Those undertakings, costing about £2.25 million, are complete.

The design of the ore preparation plant made provision for extending its capacity. It has now been decided to undertake this extension and so increase the tonnage of prepared ores, making supplies available to more blast furnaces.

The major development plan includes new blast furnaces at the Cleveland works, and the installation of ancillary blast furnace equipment at these works will fit into the blast furnace building programme, and, meanwhile, will further assist in reducing the cost of iron manufacture at the existing furnaces.

Part of National Scheme

Simultaneously with the carrying out of the first stage of the development plan, extensive preparation of the site of the Lackenby works, covering 650 acres, has been virtually completed. It is now possible to start actual construction of the new open-hearth steel plant.

Approximately 60 per cent of the work will be undertaken by the engineering departments of the company and by its subsidiaries.

The construction work now to begin is part of the National Development plan for the steel industry approved by the Government and promotes greater concentration of N.-E. Coast steel construction.

NEW ALLOY STEEL

Serviceable at Sub-zero Temperatures

THE development of a new alloy steel capable of fulfilling exceptional engineering requirements at operating temperatures as low as −423° F., has been disclosed by the Lebanon Steel Foundry, Lebanon, Pa., U.S.A. The new development is said to open the way to wide application in the chemical, oil, and other fields.

An austenitic cast ferrous alloy containing 19.50 per cent chromium and 9 per cent nickel, among other alloying constituents, the new alloy promises to have particularly useful applications in meeting the requirements of the chemical and some other processing industries. It has already been used effectively in the production of steel castings for pressure equipment in storage facilities for liquid oxygen used as a propellant for rocket engines. Such storage is maintained under high pressures at temperatures of approximately −298° F. In prospect are other applications in various restricted ordnance fields.

Unimpaired at—423°F

The company reports that the new cast steel has shown no structural changes down to −423°F. in hundreds of testing laboratory impact tests from production lots of (L)-22 castings, and the same cumulative tests have indicated appreciable increase in hardness directly proportional to the decrease in temperatures.

An added factor of engineering importance to designers and development engineers is seen in the fact that tensile strength of the particular cast austenitic alloy varies inversely with temperature, and in direct relationship with hardness. Ductility is lowered somewhat, however, but not in proportion to the increase in tensile strength, which is estimated to be approximately 200,000 p.s.i. at −423°, with retention of adequate strength factors and resistance to embrittlement.

The alloy may be welded by either gas or electric processes without the need for subsequent heat treatment, since low temperatures do not necessarily impair the as-welded impact resistance. "No embrittlement from low temperature has been noted in the cast alloy or from welds or adjacent fusion zones made from the same composition, nor has any transition zone been noted in test work covering hundreds of production heats," reports Mr. W. H. Worrilow, president of the Lebanon Steel Foundry.

I.C.I.'s £40 M. EXPANSION

Chairman on " Faith in Britain "

"WITH regard to the threatened nationalisation of our industry, the board will continue its present policy, which in its opinion is best suited for the country, for the workers, the customers and the shareholders," declared Lord McGowan, chairman of Imperial Chemical Industries, Ltd., when he addressed members of the staff of the I.C.I. Dyestuffs Division factory at Grangemouth, Stirlingshire, following his visit to the works recently.

Lord McGowan disclosed that £40 million was being sunk in expanding works in this country, which showed that I.C.I. had faith in Britain and in the world. The slight recession in business which was apparent to-day could not, so far as he could see, go far. Buyer resistance was slackening and he thought they could look forward to stabilisation of the trade position in the not too distant future.

During 1948 the company had shown some wonderful results; their profits were not made by overcharging customers but by greater efficiency in every part of the organisation. Lord McGowan sketched in brief the world picture he had obtained on his recent travels. He saw South America becoming an even greater market for British manufactured goods. Their company's products looked like being in even greater demand in South Africa with the discovery and development of new gold fields. In Tangahyika the ground nuts scheme would require pharmaceuticals, pesticides and fertilisers.

Better Dyestuffs Prospect

In China they had no factory, nor would have until conditions improved, but the people on the spot considered that even the communist regime had to realise that commerce was essential to the country and that trade would be resumed in due course. Even in the U.S.A., the home of mass production, there were still outlets for the company's commodities. At home the textile people were clearing their stocks and could be expected to begin buying the company's dyestuffs again in the near future.

He paid tribute to the management and workers of I.C.I., and to the trade union leaders connected with the company, on the marvellous record in human relations. At one time during the war 130,000 people were employed in this country by the company and not one day had been lost due to a labour dispute.

PETROLEUM CHEMICALS IN GERMANY

New Suggestions for Conversion of Plant on Dismantling List

WHILE dismantling of Fischer-Tropsch synthesis plants is continuing despite protests from interested and official German quarters, plans are being prepared for an extension of oil refining capacity and the production of petroleum chemicals in Germany from imported raw materials. A chemical plant with a throughput capacity of 50,000 tons of oil distillates is to be erected in the Bremen port area. Fr. Stapelfeldt, formerly director-general of the Deschimag Shipbuilding Company (now AG Wesser) is visiting the U.S.A. to study modern American methods in the field of petroleum chemicals, and work on the plant which will concentrate on the production of solvents and materials for the plastics industry is to start before the end of this year.

Shortage of refining capacity forced oil producers in the Emsland fields, which have greatly increased their output this year, to curtail operations, but large tonnages are now to be sent from the Emsland fields to the Shell refinery at Wesseling near Cologne, and Wintershall AG is increasing the capacity of its oil refinery at Salzbergen to 60,000 tons a year. Part of the Emsland output is being refined in the Nerag refinery at Misburg.

Synthetic Rubber

Dismantling at the plant of Chemische Werke Huels is due to start on August 31. All installations for the examination and inspection of synthetic rubber and for the manufacture of butadiene are expected to be removed, but some ancillary plants which originally were to have been dismantled will now be left in position.

The management has submitted a memorandum to the occupation authorities, pleading for the retention of plant sufficient for an output of 300 tons a month of butadiene, and three processing divisions formerly used for the production of buna on the ground that these are needed for the manufacture of "Emulsion 1073," a polystyrol emulsion into which about 25 per cent of butadiene are incorporated as a softener.

About 5 million marks are said to have been spent on the development of this product the application of which is recommended as a floor covering, for the manufacture of waterproof paper, and as a component for indiarubber products.

Ruhrchemie AG continues its campaign for the retention of its Fischer-Tropsch plant on the ground that its main value was the provision of high-class products for the manufacture of washing agents, textiles and leather. The Fischer-Tropsch products were not, it is claimed, substitutes, but equivalent, if not superior, to products from other raw materials, and could not be replaced by imported chemicals.

American Influence

Director Dr. Tramm, who recently visited the U.S.A., alleged that influential American circles were against the dismantling of Fischer-Tropsch plants. They were, he claimed, greatly interested in German research in this field and were trying to reduce the extent of dismantling operations as far as possible.

Hydrierwerke AG, which has moved from Rodleben to Dusseldorf, has resumed the production of solvents, including tetrahydronaphthalene and methylcyclohexanol, and softeners for the plastics and rubber industry; the production of some alcohol sulphonates has also been started again.

Producing sulphuric acid for chemical works in the Ruhr area, Chemische Fabrik Curtius AG, Duisburg, has overcome the war damage and hopes soon to resume full output.

Deutsche Bergius AG, Mannheim-Rheinau, also reports that the heavy war damage has been partly made good.

A fall in prices attributed to heavy lawful and illicit imports, however, had to be met while the plant was still in an initial stage of production. As a result, the company had to apply for a court order granting it a respite for payment of debts. An interim credit has been made available to the company with the consent of the Baden State Government, but at present the workers are still working short-time.

The recent price fall in the world market for non-ferrous metals has brought a number of German lead and zinc producers into the danger zone where it is doubtful whether producing costs can be met. Investigations have therefore been

(continued at foot of next page)

LEAD REACHES £87 5s. TON

Two More Price Rises

THE recent instability of United Kingdom lead prices, unsettled by the exceptional fluctuation of United States' values with which the Ministry of Supply has sought to achieve parity, has resulted in two substantial increases, last week and this.

The price of good soft pig lead at the middle of this week was £87 5s. per ton, which included two increases in quick succession, of £1 7s. 6d. on August 3 (to £82 2s. 6d.) and by a further £2 2s. 6d. on August 9.

Lead metal prices have risen by the following stages since the lowest post-war price of £75 10s. was announced—and maintained for two days—on July 12: July 14, £81; July 26, £82 7s. 6d.; July 28, £83 15s.; August 3, £85 2s. 6d.; August 9, £87 5s.

American commentary on lead prices in New York, which reached 15⅛ cents per lb. this week, after having been 21½ cents at the beginning of March and only 12 cents at the end of that month, discounts the possibility of any further large increase The latest rises are being associated with temporary influences, including U.S. Government stock piling and the re-imposition of import duties.

PETROLEUM CHEMICALS IN GERMANY

(*continued from previous page*)

started to ascertain the level of producing costs in the various mining areas of western Germany.

On behalf of the producers it is being argued that the production of indigenous ore could meet all reasonable requirements of the German market in the next two years. Domestically-produced zinc is, indeed, at present lacking sufficient outlet.

In the eastern zone of Germany the production of fluorspar is to be resumed in the Wiedersberg mine which belonged to I.G. Farbenindustrie. This mine and the Ludwig-Vereinigt-Feld plant together are expected to produce approximately 500 tons of fluorspar a month.

A process for the manufacture of enamel from cobalt slag is reported to have been developed by Schmidt & Sohn, Schwarzenberg-Neuwelt, Erzgebirge; it is claimed that the new process is independent of nickel and cobalt oxides and of felspar, while meeting hygienic requirments. The raw material is taken from slag heaps.

STEAM ECONOMY

Good Dyeworks Practice

THE measures taken to effect fuel economy in the dye-house of Courtaulds, Ltd., at its Bocking (Essex) factory, by preventing the escape of steam from dyeing machines, are described in *Fuel Efficiency News*.

Mainly as a result of fitting hoods over its winch dyeing machines, this firm is reported to have effected fuel savings in some dyeing cycles of as much as 60 per cent. Because of the shortage of stainless steel at the time, hoods were made of duralumin, and armour-plated glass windows were fitted to the sides to allow observation.

It is estimated that, although the hoods cost only about £2500, the direct saving of steam at the winch machines themselves represented a reduction of £6000 in fuel costs in one year's working.

Many Benefits

Apart from the direct saving in fuel, the advantages of using enclosed winch machines have been found, from an investigation made at Bocking, to be: Increased production due to greater availability of steam from boilers hitherto operating at peak capacity; increased rate of dyeing and better penetration of dye; better working conditions—dry floors, and a clearer atmosphere; elimination of condensation " droppings " from the roof on to fabric; prolonged life of dyehouse roofs; possible simplification of future dyehouse design by eliminating the need for fans, trunking, false roofs, etc., and additional saving of fuel because of the reduced need for warm, ventilating air to disperse moisture from the atmosphere in the dyehouse

In view of the very great economies effected and the importance of this matter to the dyeing and other trades in this country, Courtaulds, Ltd., decided to make this experience freely available, in the first place by the information given in a paper read before the London section of the Society of Dyers and Colourists, and later by a full publication of the technical data as a scientific paper in the journal of that society.

Chemical Exports

The declared value of exports of chemicals, drugs, dyes and colours in the second quarter of 1949 was £22,021,000; the estimated value at 1938 prices was £8,930,000. Coal exports in the April to June quarter were valued at £10,643,000.

HEIGHTENED ACID RESISTANCE

Passivation of Enamel Surfaces

From OUR NEW YORK CORRESPONDENT

SOME important results of experimental acid pre-treatment of porcelain enamels on the acid resistance and abrasion resistance of treated specimens have been produced in an investigation still in progress at the U.S. National Bureau of Standards' enamelled metals laboratory. The workers concerned are W. N. Harrison, J. C. Richmond, and J. R. Crandall, all of the bureau's staff. Full explanations must await the conclusion of the investigation, but, because of the current interest in these phenomena, the research workers have disclosed some of the results thus far obtained.

Tests made earlier to compare the relative effects of hydrochloric, acetic and citric acids on a number of enamels revealed that treatment with acetic acid, which produced only minor visible attack, strongly inhibited further attack when subsequently treated with citric acid, although the citric acid severely attacked the untreated areas of the same enamelled specimens.

It was found that pre-treatment with acetic acid in concentrations from 0.5 to 50 per cent for periods of five minutes or longer, were effective against subsequent treatment with 10 per cent citric acid. Treatment with butyric acid for 15 minutes produced the same effect, but neither tartaric nor lactic acid was effective.

This passivation effect, the bureau points out, may be explained on the hypothesis that the acetic and butyric acids preferentially leach alkalis from the enamel surface, leaving behind a silica-rich film which is resistant to further solution film in citric or stronger acids. With citric acid, on the other hand, the attack apparently proceeds to a greater depth before sufficient thickness of this film is built up to inhibit further solution.

During the investigation it was found that treatment for 15 minutes in 10 per cent citric acid appreciably reduced the abrasion resistance of certain enamels having Class B or Class A acid resistance (Porcelain Enamel Institute standard test), this effect being more pronounced on titanium-type enamels than on antimony-type enamels. In no case was the abrasion resistance of Class A enamels affected.

The effect of abrasion (such as would occur, for instance, when a stained spot on an enamelled article is scoured) was sufficient to reduce the rating on some enamels from a good Class B by the standard test to a poor Class C by the same test modified to include the abrasion treatment. The same amount of abrasion had no appreciable effect on the untreated areas of the specimens.

It is believed that these two effects are related, and that the silica-rich layer resulting from preferential solution of the alkali is less resistant to abrasion than the

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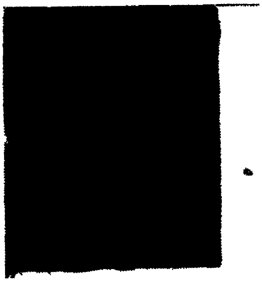

A 4 in. by 6 in. enamelled specimen, showing effect of pre-treatment with 10 per cent acetic acid on resistance to subsequent treatment with 10 per cent citric acid. The dark area (upper left) was treated with citric acid only and was badly etched

Carbon Black in Soil Experiments

Novel Use to Raise Soil Temperatures

THE knowledge that black materials are the most effective heat absorbers has encouraged some unconventional experiments in the U.S.A., employing low-grade carbon black in soil treatment to promote a significant rise in surface temperatures.

Collaborating in this research at the Massachusetts State Experiment Station with Prof. John Everson, of the University of Massachusetts, was Mr. J. B. Weaver, assistant director of research of Godfrey L. Cabot, Inc., the Boston makers of carbon black associated with the present carbon black project for Merseyside.

The soil employed in the temperature experiments was a fine, sandy loam on the grounds of the University of Massachusetts, which had been fertilised. The carbon black was mixed into parts of the soil to a depth of about 2 in., while other areas were left untreated. Accepting the estimate that an acre contains 2 million lb. of soil in the top 7 in., the report notes that the application of 4000 lb. of carbon black to an acre gave a concentration of about seven-tenths of one per cent. This is sufficient to darken the soil.

Temperatures were recorded with a potentiometer every 15 minutes, for more than a year. During the spring and summer, maximum daily temperatures reached by the treated soil surface were higher on the average, by about 2°F., than maximum temperatures of untreated soil surfaces. At a 2-in. depth, the carbon-treated soil showed maximum daily temperatures about 3.4°F. higher than those of the untreated soil. Minimum daily temperatures were slightly higher for the treated than the untreated soil, the average difference being nearly one per cent at the surface.

At temperatures above 42°F. the rate of biological activity generally doubles with each temperature rise of about 18°. Thus, it is pointed out, even a 2° temperature increase can mean a significant increase in the rate of plant growth.

Use of carbon black made from natural gas would be relatively expensive, at present prices—from 3½ to 7 cents per lb. Application rates as low as 2000 lb. an acre have been found effective, however, the chemists state. Moreover, a single treatment of a given tract should suffice for a number of years, even though some loss through erosion may occur.

There is no evidence, as yet, to indicate that carbon black "acts as a plant nutrient, is itself digested by plant roots, or has any other direct effect on plants."

HEIGHTENED ACID RESISTANCE

(*continued from previous page*)

original surface, although more resistant to acid attack.

The results suggest that titanium-type enamels are especially sensitive to the observed effects, and that routine inspection tests should be made in regular production to assure that the composition and processing of the enamels are maintained at optimum conditions.

The increased use of titanium-type enamels and the sensitivity of these enamels to attack by abrasion after treatment with acid, the bureau notes, indicate that an abrasion treatment should be incorporated in the standard test for acid resistance.

BIOCHEMISTS' CONGRESS

CAMBRIDGE next week will be the centre of the first International Congress of Biochemistry, being held from August 19-25.

The congress was initiated by the Biochemical Society with the support of the International Union of Chemistry. The president is Prof. A. C. Chibnall, and the chairman of the executive committee Prof. E. C. Dodds.

Reading of papers and discussions will be divided into 12 sections, and there will be lectures and visits to research stations and laboratories.

The sections are: Animal nutrition and general metabolism; microbiological chemistry; enzymes and tissue metabolism; proteins; clinical biochemistry; structure and synthesis of biologically important substances; cytochemistry; biological pigments; oxygen carriers and oxidising catalysts; hormones and steroids; chemotherapy and immunochemistry; plant biochemistry; industrial fermentations.

Checking of Research Measurements

Fallacy of the "Best Two Out of Three"

IN scientific and engineering investigations a single measurement of an unknown quantity is seldom considered sufficient. Two or more measurements are usually made in order to establish a check on instrumental errors, operators' errors in making readings, and the reliability of the sample.

These multiple measurements have two principal advantages: They reveal by their concordance the precision of the measuring process, and they make possible the use of an average of several measurements which will, in general, have a higher precision than one measurement alone, states the director of the U.S. National Bureau of Standards in an article contributed to the *Journal of the Franklin Institute.*

Common Practice

If three measurements are made, it is fairly common practice for students to take the "best two out of three"—averaging the two values closest together and discarding the other. Recently, however, Dr. W. J. Youden, of the statistical engineering laboratory at the bureau has shown that this procedure very often leads to less precise results than the averaging of all three measurements together.

Three measurements is the minimum number that can conceivably reveal one of the measurements to be unreliable in a new experimental situation. Intuition suggests that if two of the three measurements are in close agreement while the third stands apart considerably removed from either of the others, then there may be grounds for suspecting and perhaps rejecting the third value. In terms of the difference between the two in good agreement, how different may the third measurement be before it should be suspected?

Since this problem is important to all who make and interpret measurements, it is a little surprising that an answer has only recently been found. An approximate solution has been obtained in the bureau's statistical engineering laboratory through an empirical study of triads drawn at random from a large group of measurements constructed to conform to the characteristics of a normally distributed set entirely free from any gross errors.

In this way, it is possible to examine a great many sets of three measurements and to determine, for example, how often the two differences between adjacent values in a set of three measurements will bear a ratio of 5 to 1, 10 to 1, 20 to 1, or any other ratio that might be considered unlikely in the normal course of events.

Empirical Study

If only one out of a hundred sets of three measurements contained a measurement differing from the others by as much as five times the difference between the two closest, then such an observation might reasonably be discarded in actual experimental data. But the empirical study actually showed that a rather unbalanced spacing between three measurements occurs quite frequently.

In fact, the ratio of the two differences was as much as 16 to 1 in 10 per cent of the sets of three measurements. In this connection, it is important to note that high ratios can result when two of the readings are very close or coincident while the third is not far removed.

A Comparison

The mathematical solution of this problem has been obtained and the frequency of occurrence for various ratios of the two differences has been calculated. The following table shows for certain ratios the results of an empirical sampling study of 400 sets of three measurements compared with those predicted by the exact mathematical solution of the problem.

Ratio of Large to Small Difference	Frequency in 400 sets	Theoretical Frequency
4.0 or more	149	145.2
9.0 or more	76	69.4
19.0 or more	38	33.9

These results reveal that in an average of one out of every 12 sets, one of the measurements will be at least 19 times farther away from its neighbour than the difference separating the two closest. Since in every 12 sets one shows such a spacing for measurements with no gross observational errors, it appears that measurements which should be retained are often dropped from the record.

Polyalkylene Glycols

Wide Range of the Newer Synthetic Products

by A. E. WILLIAMS, F.C.S.

BOTH the ethylene and propylene series of glycols have become well established in industry, serving a wide variety of purposes, as diverse as the cooling of aircraft engines, the preparation of other organic chemicals and as plasticisers.

To this already extensive range of glycols, an entirely new synthetic group of polyalkylene glycols and derivatives has recently been added, which for certain applications in industry compare favourably with materials hitherto in use. Some of these applications include both high and low-temperature lubrication, the lubrication of textiles and rubber, heat transfer media, solvents, plasticisers, etc.

Special Characteristics

These synthetic materials differ both chemically and in performance characteristics from petroleum oils, animal and vegetable oils, silicones, and other synthetic oils. They have been developed by the Carbide & Carbon Chemicals Corporation, U.S.A., by which they are identified and are marketed by the trade name "Ucon," and are being distributed in this country.

The four series of these fluids which have become available are the LB and D series, which are insoluble in water; and the 50-HB and 75-H classes, both water soluble. They are inert to the most generally used metals, and have little or no effect on most natural and synthetic rubbers.

Applied as lubricants, they can be compounded with additives to produce materials suitable for use under extreme pressure conditions, where such qualities as improved film strength are required. They serve also in the preparation of various types of grease and stable, and concentrated dispersions of colloidal graphite can be made. Mixtures having non-Newtonian properties have been prepared by the addition of sub-microscopic silica to the lubricants.

These silica mixtures include transparent greases and liquids which increase in apparent viscosity with increase in temperature, or with increase in rate of shear. They also have advantages as vehicles for abrasives, molybdenum disulphide, mica, magnetic iron powder, and other solids.

As hydraulic fluids the Ucon products may be employed alone or in combination with other liquids, and they are of special value in equipment which requires efficient lubricating action such as fluid-actuated machine tools, etc.

Because they have solvent power and resistance to sludge and varnish formation, these materials maintain in a clean condition such parts as small orifices, valve seating surfaces, and other vital components. The desirable viscosity-temperature properties and low pour points of the fluids are valuable in many hydraulic applications.

Their solvent power for the decomposition products of petroleum oils promotes a cleaning action in equipment in which these oils have been used. From these synthetic lubricants it is possible to prepare shock absorber fluids having good operating characteristics.

The factor of inflammability is of importance in the application of hydraulic fluids for special purposes, and the search for a suitable fluid for use in aircraft resulted in the development of the so-called hydrolube fluids in the U.S.A. Naval Research Laboratory.

The Ucon hydrolube hydraulic fluids are composed of water, ethylene glycol, other high-boiling water-soluble liquids, a high viscosity synthetic fluid, a combination of liquid and vapour phase corrosion inhibitors, and additives to improve wear properties. By varying the proportions of water, ethylene glycol, and Ucon synthetic fluid, the viscosity of hydrolube fluids may be varied over a fairly wide range to meet different requirements.

Laboratory and Textile Uses

As heat transfer media, the synthetic liquids have found application in laboratory constant-temperature baths and in rubber and plastics processing equipment. Their advantage in this sphere is that they do not form sludges or gums and, as they do not carbonise under most conditions, they are particularly suitable when deposits would cause premature failure of electric heating elements and an appreciable loss in heat-transfer efficiency.

In the processing of textile materials the water solubility of some of these materials makes them easy to apply and to remove, and in this sphere they are excellent lubricants, are non-staining and do not produce sludge, while they have little tendency to build up static charges on yarn.

Such characteristics make the liquids of special interest in processing many types of textile fibres, and those liquids which are insoluble in water are readily emulsified, being easily washed off the fibres with a mild soap scouring. Different classes of these lubricants are of value as coning, spinning and sewing oils for cellulose acetate, nylon and glass fibres. On cotton and viscose rayon they soften as well as lubricate, which suggests potential use in finishing compounds.

Some of the liquids with higher viscosities offer excellent possibilities as wool oils which wash out of yarn or cloth with a water rinse. This property is of special interest in the production of knitting yarns and other forms of textiles which cannot be subjected to the rigorous scouring necessary in eliminating normal mineral and sulphonated oil types of lubricants. Tinting colours, when used to identify yarns, are more easily removed from the material by a light washing when the water soluble varieties of these liquids are used as lubricants.

Miscibility

In applying Ucon synthetic lubricants to textile materials the question of their compatibility with mineral, vegetable and animal oils has to be considered. The synthetic products are miscible only in limited proportions with the very low viscosity mineral oils; hence mixtures with such oils may give unsatisfactory results. A greater degree of compatibility is obtained generally with vegetable and animal oils and these can often be used as diluents for the synthetic lubricants. Since the latter are compatible with proteins, they may serve as flexibilising agents where these materials are used as binders and coatings for paper. The widely used synthetic resins, urea-formaldehyde and melamine-formaldehyde, when employed as coatings for paper, may be modified to yield superior products by the addition of the synthetic lubricants prior to the acid condensation, or during the formation of the "A" stage resin. Such compounds are also of interest in the sphere of adhesives and sizes.

Tannery Applications

In the treatment of leather, the resistance to oxidation and gumming of the synthetic fluids suggests good ground for their use. Some of the fluids may be added to the leather either alone or when dissolved in water, while some of the insoluble fluids may be emulsified in water or applied in the anhydrous form. The lubricants can also be used in the pre-fat liquoring of hides which are to be stored, and then sorted and tanned at a later date.

A new type of suede leather dressing, based on the synthetic lubricants, has been formulated and gives a soft finish which is not oily or greasy.

The boiling ranges of Ucon lubricants are in general higher than those of petroleum oils of comparable viscosity, while the vapour pressures of many of them are less than 0.01 mm. Hg. at 68°F. Evaporation rates vary, depending upon the product, surface area exposed, temperature, and the presence of oxidation inhibitors or catalysts.

Oxidation is an important factor in evaporation, since the oxidation products are under most conditions, largely of low molecular weight and volatile compounds. Oxidation inhibitors retard evaporation when oxidising conditions prevail.

The hygroscopicity of the synthetic lubricants is relatively low, as is shown in the

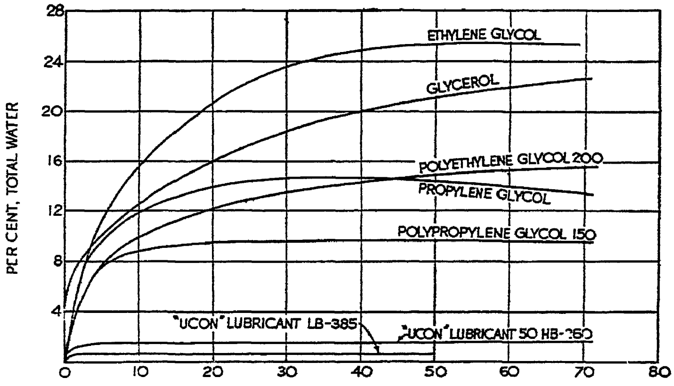

Fig. 1. Hygroscopicity at 69°F. and 62 per cent RH

graph, Fig. 1, which compares this property with that of some other materials, at a temperature of 69° F. and with 62 per cent relative humidity.

Specific heat determinations on various types of these lubricants give values ranging from approximately 0.41 at a temperature of 0° F. to 0.54 at a temperature of 300° F.

Typical thermal conductivities, at a temperature of 122° F., B.Th.U./hr./sq. ft./° F./ft., are 0.0847, 0.0859 and 0.0924. At a temperature of 194° F. these figures become 0.0842, 0.0854 and 0.0922 respectively.

Surface tension measurements, dynes/cm./68° F., made on some of the products give values ranging between 33 and 40. Spontaneous ignition temperatures of some of the lubricants, both with and without the standard oxidation inhibitor, are over 700° F., except for the very low viscosity grades, which are above 600° F. Spray inflammability tests show that high oxygen concentrations are required for ignition of mists. While these and other tests indicate that this type of product is more resistant to ignition and burning than many other materials, the lubricants are readily combustible under the proper conditions. The inflammability of the lubricants can be considerably reduced by mixing with suitable products such as water, certain phosphorus derivatives, and halogenated compounds.

Results so far achieved with these polyalkylene glycols show that their outstanding characteristics as lubricants to be summed up as follows: High resistance to formation of sludge, gum, varnish and carbon; a minimum change in properties after extended use; little change of viscosity with change of temperature; low stable pour points, and only a slight effect on both natural and synthetic rubbers.

Active Metal Catalysts

Improved Hydrosilicate Processes Described

IN catalysts of the nickel-kieselguhr type, the nickel is present largely in the form of hydrosilicates. The catalysts are, however, subject to certain drawbacks: they cannot be worked up into pellets or tablets of considerable mechanical strength; nor is the kieselguhr readily filterable, although it has been hitherto indispensable.

It has now been found that catalysts of long life, containing particularly active metals, can be obtained by converting the metals, wholly or partly, into hydrosilicates, followed by reduction. This principle forms the subject of English patent application No. 15040/1948 (Conc. date 4.6.47), of N.V. de Bataafsche Petr. Maat.

If catalyst carriers are used they must not contain free silica acid so as to form substantial amounts of insoluble hydrosilicates of the active metals. Widely varied carrier materials may be used in the new process, and the metal range is also wider Fe, Co, Ni, Pt, Pd, and other metals of the 8th group are employed. Carriers may be chosen from sintered kieselguhr, alumina, carborundum, manganese silicate, magnesium carbonate or oxide, or from other materials. A carrier having high heat conductivity is preferred in the form of powder or grit.

The active metal may be precipitated from one of its salts in solution by means of a soluble silicate, in the presence of one of the carriers named, and converted into hydrosilicate.

For the production of cobalt catalysts for the Fischer-Tropsch synthesis, reduction should be done at a moderate temperature—300-400° C.—if an active catalyst is to be formed, and only part of the active metal should be converted into hydrosilicate. For other reactions temperatures up to 500° C. may be used.

The catalyst may also be obtained from SiO_2 by precipitating thereon all the active metal in the form of a basic compound, followed by steam treatment. Alternatively, the precipitator may be left for a prolonged period in contact with the alkaline liquid before separation. A readily reducible metal compound may be present and reduced.

The catalyst, however prepared, is finally compressed into tablets, and a method of hydrogenation using such catalysts is claimed in this patent.

Copper Deposits in Thuringia

Deposits of copper-ore have recently been opened up at Sangershausen in Thuringia where some 3000 workers will find employment, according to the *Bulletin on German Questions*.

ACETYLENE CHEMISTRY

Rich Field of Contemporary Applications[*]

THE principal reason why synthetic acetylene has not been produced commercially to-day seems to be that it requires approximately as much power per thousand cu. ft. of acetylene produced in 15 to 25 per cent concentrations as it does to make the same amount of gas in 99.6 per cent concentration from calcium carbide.

The cost of purifying and separating the the other constituents is also an important factor. Another is that many materials catalyse the reaction at the high temperatures required and form undesirable by-products which are difficult to eliminate in the purification process.

The Jasco process was used to some extent at Huls, Germany, during the recent war, and according to technical committee reports, a 15 to 17 per cent acetylene was obtained with a consumption of electricity of 360 to 390 kilowatt-hours per thousand cu. ft. of pure acetylene. However, technical committee reports indicate that this installation was necessitated by the war emergency and required a tremendous investment.

Neoprene

For many years Father J. A. Nieuwland and his co-workers at Notre Dame University accomplished an enormous amount of work with acetylene chemistry. In the course of this work in the late 1920's he had difficulty in purifying the mixture of mono- and divinyl acetylene, which was made by passing acetylene into cuprous chloride catalyst under certain controlled conditions.

In co-operation with Du Pont, a process was worked out for the production of monovinyl acetylene, purifying it, and treating it with hydrogen chloride to form 2-chlor-butadiene-1,3 called "chloroprene," which on polymerisation gave neoprene.

Many patents cover this work. The process was commercialised in 1932, and the resulting product sold for $1.05 a pound. Neoprene is made in different types and has a long life under certain conditions under which natural rubber rapidly deteriorates.

Commercial uses for neoprene were soon found in spite of its high cost, for it resists heat, sunlight, many chemicals, oil, and gasolene, and, furthermore, neoprene is not flammable and has practically the same physical properties as natural rubber. Neoprene had many war uses, such as for sealing aviation fuel tanks and for withstanding the action of oils, solvents, and heat.

The maximum production during the war reached 135 million lb. annually. It is priced now at 32 cents per lb., which compares with approximately 19 cents per lb. for natural rubber f.o.b. docks, 18.5 cents per lb. for GR-S synthetic rubber, and 8.5 cents per lb. for reclaimed rubber. Father Nieuwland continued to make rich contributions to our technical literature on the chemistry of acetylene until his death in 1936.

The Vinyl Compounds

Numerous patents existed for the preparation of vinyl chloride from acetylene and hydrochloric acid. One method employed by Nieuwland was to pass acetylene through aqueous hydrochloric acid containing cuprous chloride as catalysts. Mercuric salts were also used as catalysts. However, the art never reached the commercial stage in this country until about 1927, when it was learned how to polymerise vinyl chloride to a workable plastic material.

Vinyl chloride became a commercial product in 1935. It was found to make excellent floor coverings, waterproof and non-flammable insulation for electric wires and cables, wrappings for underground pipe lines, and serve many other uses dependent on its property of being insoluble in acids, alcohols, water, and most other ordinary solvents.

The popular demand for a safety glass ushered vinyl acetate into commercial production in 1937. It was made by treating glacial acetic acid with acetylene in the presence of a catalyst such as a mercury or zinc salt. The first safety glass consisted of two thin sheets of glass cemented tightly together by a plastic material, cellulose nitrate. The transparency of such glass was impaired by darkening and discoloration.

Cellulose acetate formulations were then used for a number of years as replacements for cellulose nitrate. Casualties from flying glass in automobile accidents were solved by the use of the polymerisation product of vinyl acetate and butyraldehyde called polyvinyl butyral.

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[*] By C. J Herrly, Niacet Chemical Division, U S. Vanadium Corporation, in a paper given before the International Acetylene Association in Pittsburgh, the full text of which appears in *Chemical and Engineering News* (1949, July, p. 2062-66).

Because of the exceptional adhesive power of the vinyl compounds, even at very low temperatures, polyvinyl butyral prevents flying splinters when glass is broken. Glass bonded with polyvinyl butyral holds its transparency indefinitely when exposed to the sun and severe weather conditions.

Industrial applications of vinyl polymers, resins, and plastics seem to be innumerable because of the possible variation in the size of the polymerisation molecule which is held together by carbon-to-carbon linkage, resulting from the saturation of the original double bond of the vinyl compound.

Copolymerisation with other products such as vinyl chloride and aldehydes, makes possible a wide variety of products to suit specific conditions.

Another important development during this decade was the discovery by Shawinigan Chemicals, Ltd., that in the manufacture of acetic acid by air oxidation, acetic anhydride is formed and joins with water also produced in the reaction, as shown below, to form acetic acid:

$$CH_3CHO + O_2 = CH_3COOOH \text{ (peracetic acid)}$$

$$CH_3COOOH + CH_3CHO = H_2O + (CH_3CO)_2O \text{ (acetic anhydride)}$$

$$(CH_3CO)_2O + H_2O = 2CH_3COOH \text{ (acetic acid)}$$

They found that by adding a diluent, such as ethyl acetate to the acetaldehyde to be oxidised, a large part of the water formed was prevented from joining with the acetic anhydride to form acetic acid, so that the process produced a mixture of acetic acid and acetic anhydride.

The requirements of the cellulose acetate industry for acetic anhydride were originally filled by neutralising the recovered acetic acid from the process with soda ash, and treating the sodium acetate thus obtained with sulfuryl chloride to form acetic anhydride.

During this decade, the synthetic acetic anhydride process replaced the older process with a better product at lower cost, and thus took a large part of the acetic acid market.

It was during this period that Reppe[1], together with a large number of German scientists and engineers, made use of well-known technical data and methods to commercialise high-pressure and high temperature synthesis of chemicals from acetylene. The vinylation reaction produced vinyl ethers by the action of diluted acetylene with alcohols under pressure, elevated temperature, and with an alkaline catalyst.

The ethynylation reaction combined acetylene with other compounds without breaking the triple-bond carbon linkage, by means of copper acetylide catalyst under closely controlled conditions of temperature, pressure, and acidity. By means of this reaction he worked out a new process to make butadiene synthetic rubber.

Wartime Products

One of the first products Reppe commercialised by combining acetylene and formaldehyde was butynediol, and later, by a combination of these two processes, he obtained the product polyvinyl pyrrolidone, which was used as a blood plasma substitute by Germany during the recent war.

General Aniline and Film Corporation has just recently put a new pilot plant into operation at Grasselli, N. J., to begin the commercial production of this new line of synthetic acetylene products in this country. They are expected to have wide application in the manufacture of resins and pharmaceuticals, as well as in the paper, textile, rubber, and other industries.

During World War II, output of acetylene chemicals was greatly expanded to meet essential uses. Calcium carbide output was expanded in this country and Canada to approximately 1,050,000 tons annually, exclusive of that used for the manufacture of calcium cyanamide.

From some of our technical committee reports, it has been figured that Germany's production of calcium carbide in 1939 was 1 million short tons. Other technical reports state consumption of acetylene for chemicals during 1942 was 7.2 billion cu. ft., or approximately 800,000 tons of carbide[2] which was probably the peak year of production in Germany before effective bombing operations began to curtail production.

Because of the absence of accurate figures during the war period, it is difficult to estimate what percentage of our carbide production went into acetylene chemicals. However, according to United States Tariff Commission figures for 1948, carbide production in this country had dropped from a war peak of 825,000 tons to 682,463 tons, and the Canadian production for the same period, exclusive of that produced for calcium cyanamide, is said to have dropped from 225,000 tons to 150,000 tons.

Of this total American production, 832,463 tons in 1948, it is estimated that approximately 540,000 tons, or about 65 per cent, went into acetylene chemicals, including neoprene rubber and acetylene black.

Acetylene was used in large quantities during the war for production of acetic anhydride for the powerful explosive RDX, which was used in the "blockbuster" bombs. Large quantities of acetaldehyde were used for the production of pentaerythritol, which in turn was nitrated to produce a sensitive explosive used in anti-aircraft shells.

Vinyl compounds were used for thousands of miles of coated cable and wiring on our warships because of their unique property of not supporting combustion in case of a hit, and because of their waterproof quality and other unusual attributes.

Chemicals from acetylene were important in the production of pharmaceuticals such as acetic acid for acetanilide, vinyl acetate for sulphathizole, acetonitrile for vitamin B_1, and for many standard drugs, medicines, and pharmaceuticals required in enormous quantities during this emergency. The Chemical Warfare Service required large quantities of acetate acid and sodium acetate.

Numerous Applications

With the drop-off in demand for war uses, our energies naturally are being applied to peacetime needs and industrial uses.

Recent figures from the United States Department of Commerce report the solvent industry has grown from a half-million lb. volume 25 years ago to over six billion lb. per year. Our vinyl resin production has grown from 1.2 million lb. in 1939 to an estimated 230 million lb. in 1948.

These products are now widely used in the automotive industry; in the upholstery industry for coating fabrics; in the leather, shoe, and handbag industry; for manufacturing toys, wearing apparel, shower curtains, home building materials, and decorations; and a host of other uses.

A recent use of the vinyl resins, developed on account of their outstanding property of adhesion to metals, is that of vinyl butyral paints as the basic coat for ship bottoms for anti-fouling purposes. The top coating is paint based on a copolymer of vinyl butyral and vinyl chloride and formulated with components toxic to sea organisms.

This development is expected to save the shipping industry millions of dollars annually in dry-docking and repainting because of the long wearing properties of this coating. It is also being used on buoys.

Further Development

Another vinyl resin development is the new Vinyon fibre, a material composed of approximately 60 per cent vinyl chloride and 40 per cent acrylonitrile. This vinyl compound, soluble in acetone, is forced through spinnerettes to form a thin filament from which the acetone is evaporated. The filaments are then joined to form threads which, in turn, can be woven into textile and fabrics of unusual properties.

Monochloroacetic acid has been expanded considerably for the production of carboxymethylcellulose water-soluble types of resins for the coating and adhesive industries, synthetic indigo, and the insecticide 2,4-D (2,4-dichlorophenoxyacetic acid) now used extensively for weed killing on our lawns, golf courses, farms, railroads, etc. Production of 2,4-D is reported at 8,433,000 lb. for the last four months of 1948.

Another important insecticide is DDT (dichlorodiphenyltrichloroethane). One of the products used commercially for its manufacture is paraldehyde. This coutry's production of this product in 1948 is reported at 18,346,000 lb., an amount proving to be more than our insects are willing to consume. Neoprene production for the year 1948 is reported at 70.5 million lb.

As to our future outlook for the acetylene chemical industry, my prediction is we have merely scratched the surface of its industrial uses and applications. There are at present nine large chemical companies in this country, and one in Canada, producing chemicals from acetylene, with a total of 15 plants at various locations.

Carbide production is being modernised and expanded in this country and increased application of science to industry is being gradually realised, but these measures are not enough. We need to expand greatly our output of highly educated, scientifically trained men and women with the ability to apply science to the needs of the public as well as our industries.

REFERENCES

[1] "Advance in Acetylene Chemistry," Washington, D.C., RFC Office of Rubber Reserve, Research and Development Section, 1945.

[2] H. B. McClure and R. L. Bateman, *Chem. Eng. News*, 25, 3208-14 and 3286-9 (1947).

Technical Publications

ALUMINIUM alloy castings are being increasingly used in general engineering. The elements present in aluminium castings and alloys, with some notes on methods for their introduction, are the subject of an article by D. C. G. Lees (The Aluminium Development Association), in the *Murex Review* (Volume 1, No. 4, 1949), published by Murex, Ltd., Rainham, Essex. Another article, by E. A. Chidley, describes the method used in the Murex laboratories for the determination of molybdenum in ferro molybdenum. Copies of the *Review* may be obtained on applica- to the publishers.

* * *

THE Manufacturing Chemists' Association, Inc., has issued, in the U.S.A., Manual Sheet TC-7, "Tank Car Loading and Unloading Platforms." The seventh in the association's tank car series, it outlines definite recommendations regarding the type of approach platform which should be used by chemical manufacturers and processors. The publication is being supplied from the association's offices, 246 Woodward Building, Washington 5, D.C., and costs 20 cents, plus postage.

* * *

INCREASING interest in aerosol technique, and its many applications in industry and medicine, lends importance to any new developments. The Phantomyser equipment now available from Aerosols, Ltd., London, for the mechanical production of aerosols, makes use of the compressed air and jet system of primary atomisation. The machine, which is self-contained and portable, consists essentially of an electrically driven air compressor with a system of jets and baffles.

* * *

APPRECIATION of the value of the photoelectric colorimeter as a method of analysis has greatly increased in recent years, and an authoritative work on the subject is therefore welcome. In "Photoelectric Methods in Clinical Biochemistry" (Hilger and Watts, Ltd., 15s.), Dr. G. E. Delory, assistant professor of biochemistry, University of Manitoba, Winnipeg, Canada, describes methods based on several years of experience with colorimetric analysis of biochemical substances. There are 21 illustrations and diagrams.

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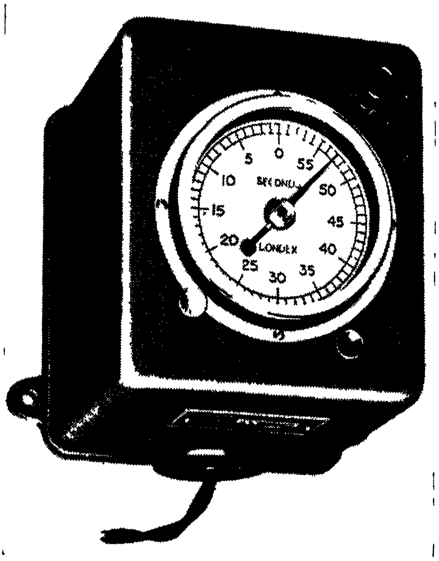


Illustrating the tendency towards smaller sizes in timing devices, the Londex synchronous process timer is particularly suitable for controlled operation of moulding presses, heat treatment of metals and automatic weld timing

REQUIREMENTS of the Pharmacy and Poisons Act 1933 and the Poisons Rules, have been set out in the "P.J. Poisons Guide" (fifth edition, the Pharmaceutical Press) to facilitate the handling of poisons by pharmacists in retail business. The guide is divided into four classes which cover all poisons, whether in Part I or Part II of the List. Interleaved copies of the booklet cost 4s.

* * *

A VALUABLE guide to the pharmacist confronted today with a wide variety of emulsifying agents, all having varying properties and requiring different methods of treatment, is now available in "Pharmaceutical Emulsions and Emulsifiers," by L. M. Spalton, published by *The Chemist and Druggist* (pp. 132, price 5s. 6d. post paid). Starting with a simplified presentation of the theory of emulsions, the book covers most aspects of the subject, giving details of handling each type of emulsifying agent and notes on incompatibilities. There is a classified index of over 300 emulsion agents and other substances.

THE FUTURE OF STEEL

Progress Reviewed at Glasgow

SPEAKING at the opening ceremony, last week, of the British Iron and Steel Federation's exhibition, Glasgow, the Lord Provost of Glasgow, Mr. Victor D. Warren, asked three pertinent questions on behalf of the people of Glasgow.

"If what has occurred in coal, railways, and electricity occurs in steel, will the housewives of Glasgow be able to purchase their household requirements in steel any more cheaply because of nationalisation?" he asked. "If we take the example of the coal industry and the multiple stoppages which have occurred since it was nationalised, will the steel-worker be any more content or any better paid under nationalisation than he is at present? In what way will the prosperity of the city be affected if steel is brought under national control?"

He was entitled, he continued, to use as his guide for the answers to these questions the experiences the country had already had—airlines which could run at nothing but a loss, railways which could not run trains up to time, and a coal industry which did not produce or export the same amount of coal as it did in 1938.

The British Iron and Steel Federation did well at this time to show the people of Glasgow that here was an industry controlled by private enterprise that paid good wages, and was free from discord.

ADVICE ON RESEARCH

DSIR's Service at Exhibition

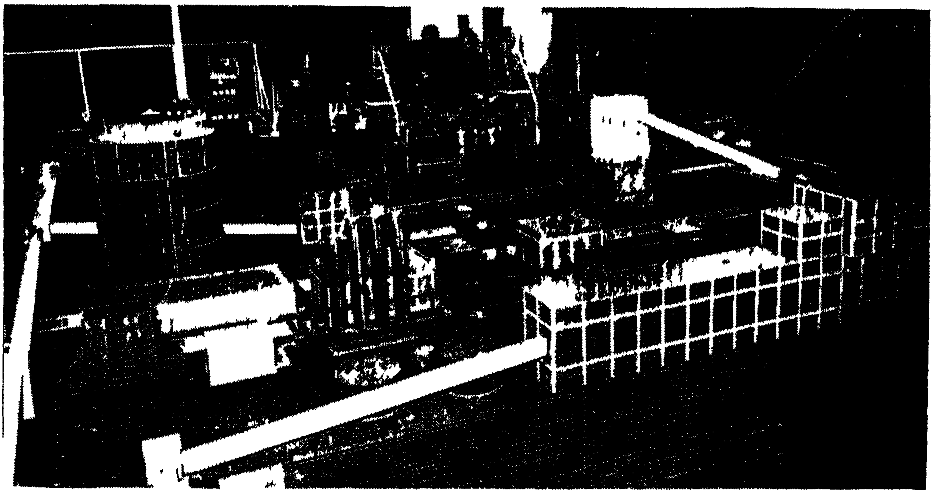
AT the Scottish Industries Exhibition, to be held in the Kelvin Hall, Glasgow, next month, it is the intention of the Department of Scientific and Industrial Research to offer complete consulting facilities for manufacturers. At its stand there will be an information counter and a consulting room, staffed by specialists and members of the department's intelligence division

The growth of research associations in industry will be emphasised. There are about 40 such organisations in existence, covering a wide range of industries. A number of these will be featured in the section "Building a Factory," designed to explain how research can help in every stage.

There will also be a model of the department's new laboratories at Thorntonhall, East Kilbride, which are to be completed in the next few months, and where research into problems of lubrication and machining will be carried on.

OCCA Exhibition

The London section of the Oil and Colour Chemists' Association is to stage another technical exhibition of raw materials and apparatus on the lines of the one held in April this year. It will be held in March, 1950, at the Borough Polytechnic, London, S.E.



The model steel works, reflecting characteristic current planning, at the BISF exhibition in Glasgow. It included blast furnaces, coke ovens, gas holders and by-products plant

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

UNDER a new distribution programme announced by the U.S. Atomic Energy Commission, cyclotron-produced, as distinct from reactor-produced, radioisotopes will be made available to research men in the U.S.A. The programme will augment the present distribution of reactor-produced radioisotopes, which, since August, 1946, has provided 6975 consignments of radioisotopes of nearly 60 elements, representing nearly 100 isotopic species, through the facilities of the Atomic Energy Commission. Only those isotopes having half-lives of more than 30 days will be distributed initially. Included in these are 43-day beryllium 7, 3-year sodium 22, 44-day iron 59, 4-year iron 55, 250-day zinc 65, 90-day arsenic 63, and 56-day iodine 125. Other cyclotron-produced radioisotopes of significant value as tools of research may be added later. In announcing the programme, the AEC says that although the uranium chain-reacting reactor far surpasses the cyclotron in quantity production of radioisotopes created by fission and by certain other neutron reactions, a considerable number of important isotopes cannot be produced with the reactor. The cyclotron is a necessary and vital complement to the reactor for supplying tracer isotopes, because of the wide variety of nuclear reactions it can produce.

* * *

The U.S. Patent No. 2,464,267—Dehydrating Alumina in the Production of Aluminium—has been made available for royalty-free licensing by the U.S. Department of the Interior, to whom the patent was assigned by the inventor, Allan M. Short. In the process described, hydrated alumina is directly distributed on the crusted surface of a molten electrolytic bath to cause partial dehydration of the feed alumina. The feed is then directly mixed with the molten electrolyte and is completely dissolved very rapidly. The slow and incomplete solution of " alpha alumina " of former methods is avoided so that expensive calcination at high temperatures may be dispensed with in the production of aluminum.

* * *

A new family of rubber chemicals, to be known as Wing-Stay S, has been developed by the chemical division of the Goodyear Tyre and Rubber Company. Now available in production quantities, the new material, an amber liquid for which the company claims " excellent anti-oxidant and superior non-staining and non-discolouring properties," may be used in both natural and synthetic rubber and latices.

* * *

Additional facilities for the production of methoxychlor, basic ingredient for a new line of insecticides, and methoxychlor composition (The Chemical Age, *61*, 116-120) are to be put in operation at the Linden, New Jersey, plant of Grasselli chemicals department of the Du Pont Company this autumn. The demand for methoxychlor and its various formulations as an insecticide is stated to have greatly increased. The company introduced methoxychlor in 1947, after five years of investigation of its insecticidal efficiency, crop safety and toxicity to warm-blooded animals. In April this year the U.S. Department of Agriculture recommended its use on dairy animals, dairy barns, on forage to be fed to dairy animals, and on other animals being finished for slaughter. The synthetic organic insecticide has high insecticidal efficiency, does not tend to accumulate in body tissues of animals and is effective against flies which have developed a resistance to DDT.

* * *

With the installation of refrigeration equipment nearly complete, the B. F. Goodrich Chemical Company is planning to begin production of low temperature polymerised GR-S " cold rubber," this month at the American rubber plant it is operating for the Government at Port Neches, Texas. When in full production the plant will have a rated capacity of 30,000 tons annually. The Government will then have five plants throughout the country producing the new type of rubber, all operated by private companies. By October, American plants should be turning out 15,600 tons of the rubber each month, towards the programme for an annual production of 200,000 tons. This rubber, made at a temperature of 41 C. instead of the usual 122°C., has shown superior tread wear resistance to standard GR-S, but has still to prove its qualities in other applications.

· PERSONAL ·

Prof. Humphrey Francis Humphreys, head of the school of dental surgery at Birmingham University, has been appointed vice-principal of the university in succession to Prof. M. L. E. Oliphant, who will relinquish the office on September 30. Prof. Oliphant will continue to occupy the Poynting chair of physics. Dr. F. Morton, a reader in the department of chemical engineering at Birmingham University, has been appointed to the second chair of chemical engineering in succession to Dr. Stacey Ward, who was recently appointed to the chair of mining in the university. A further Birmingham University appointment is that of Mr. Alfred John Murphy as professor of industrial metallurgy, in succession to Prof. Leslie Aitchison, whose retirement, on the grounds of ill-health, was announced earlier in the year.

Mr. J. R. G. Marchetti, of John Crossley & Sons Ltd., has been re-elected chairman of the board of management of the British Colour Council. Mr. H. H. Bowen, of the Bradford Dyers' Association, Ltd., and Mr. E. W. Goodale, C.B.E., M.C., (Warner & Sons, Ltd.), and Mr. D. Carter (Wolsey, Ltd.), have retired from the board, but will continue to serve in an advisory capacity.

Mr. Victor D. Warren, Lord Provost of Glasgow, who is regional manager for Scotland and Northern Ireland of Imperial Chemical Industries, Ltd., has been awarded the Glasgow Corporation Medal for Bravery for the part he played in rescuing a companion and in making a valiant attempt to save the third member of the party when their boat overturned on Loch Arkaig, Inverness-shire, in May.

Mr. Guy Dutton, who has been associated for a number of years with the Sir John Cass Technical Institute, London, and is a contributor to The Chemical Age, has sailed for Canada, having accepted appointment as a lecturer in the department of chemistry in the University of British Columbia, Vancouver, B.C.

Mr. John M'Kechnie, secretary of the Mirrlees Watson Co., Ltd., engineers and machinery manufacturers, Glasgow, has died at his home in Giffnock. He was secretary of the company for nearly 20 years, having joined it in 1906 as a junior clerk.

Dr. F. J. Wilkins

Glaxo Laboratories, Ltd., announces that Dr. F. J. Wilkins has been appointed executive director in charge of the company's factories at Ulverston and Barnard Castle. He took up his duties on August 2. Born at Cardiff, Dr. Wilkins was educated at the Universities of Wales, London, and Cambridge. He took the degrees of B.Sc. (London) in 1924; M.Sc (London) in 1927; and Ph.D. (Cambridge) in 1939. He joined Imperial Chemical Industries in 1933, and was loaned to the Filling Factory Department of the Ministry of Supply in 1941. In 1945 he accepted an appointment in the Scientific Civil Service as deputy chief superintendent of armaments research. He became director of chemical research and development in the Ministry of Supply in 1946, and in April, 1948, was principal director scientific research (defence) with responsibility for the research divisions of the munitions side of the Ministry of Supply.

Mr. A. E. Smeeton, formerly an export sales manager of Evans Medical Supplies, Ltd., is shortly leaving for Brazil to take up an appointment with Productos Evans Soc. Anon. Mr. L. E. Schofield, who has recently returned from an extensive tour overseas, has been appointed to succeed him.

Mr. W. John Merrick, publicity manager of Evans Medical Supplies, Ltd., has been elected to the council of the Liverpool and District Publicity Association.

HOME

Decline in Use of Rubber

Consumption of natural rubber in the United Kingdom during June amounted to 12,943 tons, the lowest monthly total since August, 1947. Production in Ceylon during June was 6,500 tons, a drop of 500 tons from the May figure.

Groundnut Arrivals

In three months ended June 30, 37,507 tons of groundnuts passed through Liverpool docks. This takes no account of the large tonnages going direct to Lever Bros.' own dock at Bromborough. The bulk of groundnuts arriving in the Mersey still come from West Africa.

Reinstatement of Workers

The Clyde Paper Mills, Ltd., Rutherglen, announces that its orders are now sufficient to justify the full employment of workers who have been on short time since a big pay-off several weeks ago. Employees in the coating department returned to normal working last week-end.

ECA Purchases

ECA contracts with the United Kingdom for the period April 3, 1948-July 15, 1949, cover purchases of 26,000 long tons of rubber, 12,000 long tons of sisal, $4,500,000 worth of industrial diamonds, 200,000 oz. of quinine, 10,000 tons of palm oil and 19,800 metric tons of flaked and fine graphite. Sperm oil and platinum were also included.

Coal Output

Production of deep-mined and opencast coal in Britain last week was the lowest this year, although higher than in the corresponding holiday week last year. Comparative figures are:—Last week: 2,580,700 tons (deep-mined 2,411,300 tons, opencast 169,400 tons); previous week: 2,701,900 tons (deep-mined 2,450,000 tons, opencast 251,500 tons).

Brazil Export Programme

Under the agreement concluded in Brazil last week the United Kingdom will provide exports to the value of £30,775,000, to include chemicals, coal, iron and steel and non-ferrous metal manufactures, textiles, vehicles and pottery. In addition, the accustomed export of petrol and petroleum products to the value of some £7.5 million will continue. The reciprocal import programme, to include rice for Commonwealth countries, will cover goods worth £33,349,500.

Canadian Metals for Britain

Reports from Washington state that $17,006,000 has been granted to Britain to enable her to buy aluminium and copper from Canada under the Marshall Plan.

Cheaper Borax

Reduced prices for borax were announced this week by Borax Consolidated, Ltd. The new rates, per ton in bags, delivered, are: Granular commercial, £27: anhydrous £46.

Mission to Pakistan Likely

The prospect of sending a trade mission to Pakistan this year was discussed at a meeting last week between Mr. A. G. Bottomley, Secretary for Overseas Trade, and Mr. Chulam Mohammed, the Pakistan Finance Minister.

Prices of Oils and Fats

There will be no change in the prices of unrefined oils and fats and technical animal fats allocated by the Ministry of Food to primary wholesalers and large trade users during the four-week period ending September 3.

Employment Maintained

Employment at the end of May in the chemical and allied manufacturing plants accounted for 437,000 persons, according to the July summary issued by the Minister of Labour. This represents no change from the April total, which was some 4000 larger than the corresponding figure for the end of 1948.

New Chemistry Department

Work on the new chemistry block of Aberdeen University, expected to take over two years to complete, is being pushed ahead. The new building, estimated to cost about £300,000, will house the whole of the chemistry department, now at Marischal College. This conforms with the policy of transferring all the scientific departments of the University to Old Aberdeen.

Insecticide Residue on Fruit

The persistence of insecticidal matter on the new season's pears now arriving from Italy has been the subject of examinations made by various Medical Officers of Health. These have shown that a relatively small proportion of the fruit still retains a slight trace of an antiparasitic spray. The Italian commercial authorities have taken steps to prevent further consignments of affected fruit from being exported.

INDIAN SODA ASH MARKET

Local Concern for Production and Protection

From OUR OWN CORRESPONDENT

WORK had recently to be suspended at the two soda ash plants in the Indian Union—Tata Chemicals at Bithapur and the Dhrangadhra Chemical Works—owing to accumulation of large stocks. This surplus is attributed in India to the existence of heavy imports of soda ash at prices lower than the Indian product.

As a result, application was made to the Government for protection or assistance to dispose of existing stocks and permit the resumption of operations.

At the recent inquiry into the claim in Bombay by the Indian Tariff Board Mr. G. L. Mehta, the chairman, recalled that consumption of soda ash in India had been estimated at 112,000 tons annually.

Holding that the consumption of soda ash was often considered a criterion for the industrial development of a country, he stated that the annual consumption in India was 0.6 lb. per head as compared with 56 lb. per head in the U.S.A. While the annual rated capacity of the industry was 16,800 tons, the actual production in India at the peak level was 20,000 tons in 1948.

Prices too Competitive

Referring to the circumstances which had led to the closing down of the two plants, he said that favourable conditions of raw materials and large-scale production had enabled manufacturers in foreign countries to produce soda ash at much cheaper rates. He cited the spectacular increase in production during the war, particularly in the United States and in the United Kingdom and other countries, where the ammonia-soda process had been developed under a system of combines, with controlling interest in plants spread over different countries of the world.

Indian production of soda ash was restricted to the light variety. This meant that industries like glass-making, which required heavy ash, had to import their raw materials.

Since the consumption of soda ash by the glass industry formed approximately one-quarter of the total requirements of India, Mr. Mehta inquired whether the Indian producers of soda ash could not convert part of their soda ash plant for the manufacture of the heavy variety of ash, or alternatively, whether the glass industry could explore the possibility of substituting heavy ash by light ash without a great deal of alteration in the equipment of the factories.

Caustic Soda

Among heavy chemicals proving of most importance to India is caustic soda, and the Industries Conference in 1947 recommended that all measures should be taken to provide at least 20,000 tons in six months.

Caustic soda has been extensively used in India in the manufacture of soap, paper rayon, mercerised cotton, dyestuffs, explosives, vegetable oil refining, and other allied industries. Annual consumption in India is estimated at the following rates: Soap industry 24,000 tons, cotton textiles 15,000 tons, paper industry 900,000 tons, vegetable ghee and oil refining industry 1500 tons, and other chemical industries 20,000 tons.

ISRAELI OPTICAL LENSES

ISRAEL's first major optical lens grinding plant, equipped for large-scale output, has begun operations in Haifa. The firm was established by new immigrants, who brought with them machinery, training and valuable experience in this delicate technical process.

The plant incorporates new inventions developed at the German Zeiss and Steinhel optical works after the war and was shipped to Israel by four immigrants six months ago. With loans from the Jewish Agency and the Israeli Government, they set up their machinery in the Industrial House in Haifa, and are now turning out spectacle lenses for any of the 32,000 possible prescribed combination of eye glasses.

As the cost of glass, the main raw material, is only about 12 per cent of that of the finished product, local lens grinding on a major scale should save a substantial amount of foreign currency. The plant's capacity is said to be sufficient to meet the country's entire demand.

OVERSEAS

Source of Fluorine Chemicals

Demand for fluorite, particularly from the steel industry, has encouraged the re-opening of the Chavagnac-Lafayette seams and there is talk of exploiting the Saint-Laurent-les-Bains seam. Exports to the U.S.A. are visualised.

Oil in Alsace

Exploratory work carried out by the Pechelbronn Company in the area of Soultz-sous-Forêts is reported to have resulted in the discovery of oil at a depth of 863 metres. In the initial stage of exploitation, a daily output of 500 metric tons is expected. This is the second oil well sunk in Alsace since the liberation.

Reported Uranium Finds

A Western Australian prospector claims to have found Australia's richest uranium deposit 85 miles from Marble Bar, North-Western Australia. Uranium ore is also reported to have been found in Honduras, and samples have been sent to the United States Atomic Energy Commission.

Iran's Own Oil Project

The Iranian Cabinet is reported to have approved the formation of an Iranian oil company which is to explore and exploit areas outside the Anglo-Iranian Oil Company's concession. The initial capital of this new company is expected to be about £1.1 million.

Isotopic Tracers

Nearly 600 shipments of radioactive isotopes for use in scientific, agricultural, medical and industrial research have been sent to 21 countries, including Great Britain, the United States Atomic Energy Commission announced last week. More than 7500 consignments have been sent in three years to American and overseas laboratories.

Dow Chemical Sales

The view that the chemical industry generally should feel price reversals less strongly than some other industries, because it had raised prices only moderately during the period of inflation, was expressed by Mr. Leland I. Doan, president of the Dow Chemical Co., in the firm's 52nd annual report, issued recently. The need for product and methods improvement throughout many industries should help to maintain chemical markets, he suggested. Dow's sales were valued at $200 million, against $171 million in the previous year.

S. Rhodesian Magnesite

Deposits of magnesite recently discovered accidentally near Beit Bridge, Southern Rhodesia, are believed to be among the most extensive in South Africa, and second only to those in the Barberton district of the Transvaal.

Aid for French Potash

The Economic Co-operation Administration has given approval of a project to expand and modernise the potash mines owned and operated by Mines Demaniales de Potasses d'Alsace, Mulhouse, France. The project will require an ECA contribution equivalent to £1 million and French francs to the value of about £30 million.

New Australian Oil Refinery

A new £1 million oil refinery was opened last week by the Vacuum Oil Company at Paisley, eight miles from Melbourne. The works covers some 60 acres, and an adjoining 110 acres has been bought with a view to expansion when machinery is available.

French Chemicals in 1948

French sulphuric acid production in 1948 totalled 1,275,000 tons against 1,139,000 tons in 1938. Chloride produced amounted to 66,500 tons compared with 47,000 tons in 1938, and nitrogen to 176,000 tons (200,000 tons in 1938). The Kuhlmann factories in 1948 produced 620,881 tons of insecticides and fertilisers.

Australian Coalfield Development

An American offer involving the investment of £stg.6.25 million has been made for development of the Blair Atholl coal field in Central Queensland, states a Reuter report. The deposits here have been estimated at not less than 200 million tons, and it was announced last year that at least £stg.9.6 million would be spent on the development scheme, in which two British concerns are interested.

Rising German Activity

Exports of pharmaceutical products from Western Germany continue to increase. For the first quarter of 1949 they amounted to 4.25 million Dm. against 1.21 million in the same period in 1948. This is still only 10 per cent of the pre-war turnover. Preparations are being made for the production of perlon (the German form of nylon) in Western Germany and large-scale production at Bobigen (formerly I.G.) will start at the beginning of 1950.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgage Satisfaction

CHROMOCINE LTD. (M.S., 13/8/49). (formerly Chemical Development Co., Ltd.), London, W., dealers in chemicals, etc. Satisfaction July 12, of mortgage registered August 31, 1945.

Company News

The A.P.V. Company, Ltd.

The 39th ordinary general meeting showed that the group had maintained a strong financial position in the year ended December 31, 1948. Current assets £2,158,491 exceeded current liabilities by £789,904. Fixed assets and investments in subsidiary and associated companies were £311,722, and issued capital, reserves and accumulated profits £1,000,626. Dividend on ordinary shares remained unchanged at 50 per cent.

Benn Brothers, Ltd.

The directors recommend the payment of the following final dividends, less tax, for the year ended June 30: three per cent on preference shares, making 6 per cent for the year; 20 per cent on ordinary shares, making 25 per cent for the year (same); 5s. per share on the deferred shares (same).

Fricker's Metal and Chemical Co., Ltd.

Net profit for 1948 after full provision for taxation, £14,000 for depreciation, and £3000 for deferred repairs, was £90,009. After transferring £75,000 to general reserve and crediting £4349 brought in, available profit is £19,358 (£17,011). Directors recommend dividend of 10 per cent, and bonus of 5 per cent (both same) on ordinary shares.

New Registrations

Chemia Products (U.K.), Ltd.

Private company. (471,579). Capital £5000. Manufacturers and refiners of chemicals of all kinds. Directors: J. Lowe and C. H. Warbey. Solicitors: Kaufman & Maurice Abrahams, 72 New Cavendish Street, W.1.

Fillod Sales, Ltd.

Private company. (471,496). Capital £5500. Objects: To acquire from F. L. Crilly the benefit and obligations under an agreement with Fillod Developments, Ltd., relating to sales of that company's products; to acquire patents and inventions; to act as advisers; to deal in metals, plastics and synthetics of all chemical groups, textile and other materials, etc. Directors: F. L. Crilly; S. Thorne, 2 Flambard Road, Harrow, Middlesex.

Sinbor Products, Ltd.

Private company. (471,393). Capital £5000. Manufacturers of colloidal sols and gels and mixtures of natural or synthetic elastomers both organic and inorganic, in coated materials, artificial leathers, paints. Directors: S. P. Haycock, H. H. Haycock. Secretary: H. H. Haycock. Reg. office: 34 Glenburn Road, Kingswood, Bristol.

Walker Davis & Co., Ltd.

Private company. (471,543). Capital £1000. Manufacturing, analytical and consulting chemists. Solicitors: Reynolds Gorst & Porter, 7 Arundel Street, W.C.2.

Increases of Capital

The following increases have been announced: YORKSHIRE DYEWARE AND CHEMICAL CO., LTD., from £250,000 to £800,000. Industrial & Scientific Instruments Ltd., from £1000 to £10,000.

Changes of Name

The following changes in name have been announced: MIDLAND OIL CO., LTD., 85 Clifford Street, Lozells, Birmingham, 19, to MIDLAND PAINT & OIL CO., LTD.; ADHESIVE & ALLIED PRODUCTS, LTD., 11 Upper Grosvenor Street, W.1, to B. & B.I. (GROSVENOR), LTD.

Control Revoked

The Minister of Food has revoked the Manufactured and Prepacked Foods (Control) Order, 1942 as from August 7, from which date no licences will be needed for the manufacture and/or prepacking of, among a long list of products, the following: Essences, extracts (meat, yeast and vegetable), flavourings, food colourings, gelatine and gelatine products, salt, vinegars (including artificial vinegar).

The Stock and Chemical Markets

DESPITE a small, late recovery, another heavy fall in British Funds dominated stock markets this week. The volume of business remained restricted, and small selling had an exaggerated effect in some sections owing to the absence of demand. Long-dated stocks, particularly 2½ per cent Consols and Treasury Bonds and the nationalisation issues, were governed by a further sharp fall in 3½ per cent War Loan, which at one time was only slightly above the low level of 93¼ reached by this stock in 1940. Gas 3 per cent was affected by news of the further issue of this stock as compensation. Compared with initial dealings in gas stock at over par, the current price is only 89¼.

Chemical and allied shares have been fairly steady conforming with the prevailing trend in industrials, but the volume of business was so small that, except for the well known and widely held shares, quotations were not tested by dealings.

One view is that markets are likely to remain in a state of suspense until next month, when the outcome of the Washington talks should clarify the position. The downward trend of exports to the U.S. has probably not yet been checked.

Imperial Chemical moved back sharply to 41s. 7½d., following a little selling. Monsanto eased to 50s., Laporte Chemicals 5s. ordinary have been at 21s., Fisons 44s., Brotherton 10s. shares 20s., Albright & Wilson 27s. 9d., and Amber Chemical 2s. shares 4s. 4½d. Blythe Colour were 35s. 7½d., and Boake Roberts 28s. 6d. Elsewhere, British Glues & Chemicals have been steady at 18s. 6d., and General Refractories 23s. 1½d. There was buying of Lever N.V. up to 44s. 4½d., although the shares of Lever & Unilever, the English company, were little changed at 42s. 6d. Lever N.V. is among shares being favoured as a "hedge" against the possibility of currency devaluation. Dollar stocks, such as International Nickel, also attracted more attention for a similar reason. Shares of companies regarded as big dollar earners were favoured, including United Molasses, which changed hands around 38s., and Turner & Newall (74s. 6d.), but the 4s. units of the Distillers Co. eased to 24s. 9d. Borax Consolidated remained at 50s.

Iron and steel shares have been firmer, helped by the record steel output figures. Guest Keen were favoured and higher at 57s. 6d., while United Steel firmed up to 26s. 6d. In other directions Babcock & Wilcox rallied to 57s., with the new share, at a premium of 9d., after opening at a discount of 1s.

Boots Drug were firmer at 48s. 6d.; Glaxo Laboratories changed hands around £18, while British Drug Houses 5s. shares were around 7s. Among shares of companies connected with plastics, De la Rue were 27s. 3d., and British Xylonite 65s. 7½d.

Market Reports

ACTIVITY in most sections of the London chemical market is affected by the seasonal easing in demand and new business continues to be on a reduced scale. The soda compounds, generally, are in good call and caustic soda, bicarbonate of soda and chlorate of soda are all receiving attention. Bleaching powder, formaldehyde, hydrogen peroxide and acetone are other items in steady request. A slight increase in demand is being experienced for fertiliser materials. Quiet conditions persist on the coal tar products market, home quotations remaining unchanged

MANCHESTER.—Fairly brisk trading conditions have been reported on the Manchester chemical market during the past week and holiday interference with business has been less marked than it was in the two previous weeks. Substantial quantities of textile chemicals are being taken up by the Lancashire cotton and allied trades, and other leading industrial users appear to have been active. Prices show little change on balance for the week, although uncertainty continues regarding some of the non-ferrous metal products. Most sections of the tar products market are quiet and some easing of prices seems to be expected.

GLASGOW.—Conditions have been a little more active in the Scottish heavy chemical market during the past week, although turnover is not yet back to normal after the holidays. No particular demands have been noted apart from the seasonal increases in the use of farmaldehyde and potassium nitrate.

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* *"Journal of Soc. of Chem. Industry." Vol. 66, No. 5. pp. 138/139.*

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each Higher priced photostat copies are generally available.

Complete Specifications Accepted

Methods and apparatus for measuring and controlling a moving column of plastic material.—E. A. Hawk. Nov. 4, 1946. 624,017.

Manufacture of polyazo dyestuffs.—J. R. Geigy Akt.-Ges. Nov. 9, 1945. 624,018.

Preparation of polysiloxane resins.—British Thomson-Houston Co., Ltd. Nov. 21, 1945. 624,019.

Polysiloxane resins.—British Thomson-Houston Co., Ltd. Nov. 21, 1945. 624,020.

Process for the production of zirconium and hafnium compounds.—C. E. Every (Titanium Manufacturing Co.). Dec. 17, 1946. 624,120.

Reagent for testing for acetone.—Denver Chemical Manufacturing Co. Dec. 24, 1941. 623,821.

Organic compounds. — Ilford, Ltd., H. D. Edwards and J. D. Kendall. Jan. 9, 1947. 624,028.

Continuous crystallisation. — Imperial Chemical Industries, Ltd. June 21, 1946. 624,125.

Apparatus for dispensing gases.—Linde Air Products Co. Jan. 31, 1946. 624,128.

Gas purifiers.—H. Singleton. Jan. 30, 1947. 623,823.

Process for the manufacture of pentaenes.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., Akt.-Ges.). Feb. 20, 1947. (Addition to 605,208.) 623,826.

Catalysts.—Imperial Chemical Industries, Ltd., P. W. Reynolds and J. A. Mackenzie. Feb. 26, 1947. 624,035.

Process for stabilising dichlorodiphenyltrichloroethane.—Imperial Chemical Industries, Ltd., and A. Lamble. March 20, 1947. 624,136.

Process for the manufacture of unsaturated halogen compounds and products of dehalogenation thereof.—Ciba, Ltd. April 30, 1946. 624,047.

Manufacture of terephthalic acid.—I.C.I., Ltd., C. H. Bowden, G. M. Henderson, and S. R. Robinson. May 9, 1947. 623,836.

Production of hydrogenation derivatives of dypnone.—A. Boake Roberts & Co., Ltd., and E. J. Lush. May 15, 1947. 623,838.

Stilbene derivatives for use in whitening textile materials.—I.C.I., Ltd., D. A. W. Adams, and R. H. Wilson. May 19, 1947. 624,051, 623, 849, 624,052.

Carbonisation of carbonaceous materials.—Standard Oil Development Co. Oct. 26, 1946. 623,899.

Apparatus for treating with liquids samples of textile materials.—I.C.I., Ltd., and E. Marney. May 27, 1947. 624,054.

Apparatus for producing a suspension of liquid in a gas.—Andre (Components), Ltd., and V. A. Trier. June 4, 1947. 623,955.

Atomiser for discharging material in a molten state.—N. V. Enkes. Feb. 21, 1942. 624,066.

Method for desulphurising iron and steel with molten calcium carbide.—Air Reduction Co., Inc. Dec. 8, 1943. 623,966.

Method of treating sheets of ferrous silicon magnetic material to produce an electrically insulating film on the surfaces of the sheet.—Westinghouse Electric International Co. July 24, 1941. 623,892.

Liquid or gas measuring and dispensing apparatus.—S.A.T.A.M. Soc. Anon. Pour Tous Appareillages Mecaniques. Aug. 19, 1941, 624,454.

Production of magnesium base alloys. —Magnesium Elektron, Ltd., C. J. P. Ball, F. A. Fox, A. C. Jessup, P. A. Fisher, and A. L. Hock. March 12, 1945. 624,304.

Methods for producing penicillin.—A. J. Moyer. April 8, 1944. 624,411.

Process of separating fatty acids.—A. H. Stevens. (Emery Industries, Inc.). Sept. 5, 1945. 624,415.

Vulcanised poly furfuryl products.—J. B. Pierce Foundation. Jan. 13, 1945. 624,312.

Organo-silicon compounds.—Westinghouse Electric International Co. March 9, 1945. 624,361.

Organo-silicon compounds.—G. R. Shepherd (Westinghouse Electric International Co.). March 8, 1946. 624,362, 624,363.

Method of isomerising butane.—Compagnie Française de Raffinage. July 17, 1945. 624,367.

Supporting disc for mounting textile fibre cakes in a column with a view to their treatment by wet process under pressure.—J. Annicq. Aug. 16, 1946. 624,441.

Apparatus for igniting a combustible gaseous mixture immersed in a liquid.—W. B. Smits. Nov. 1, 1945. 624,376.

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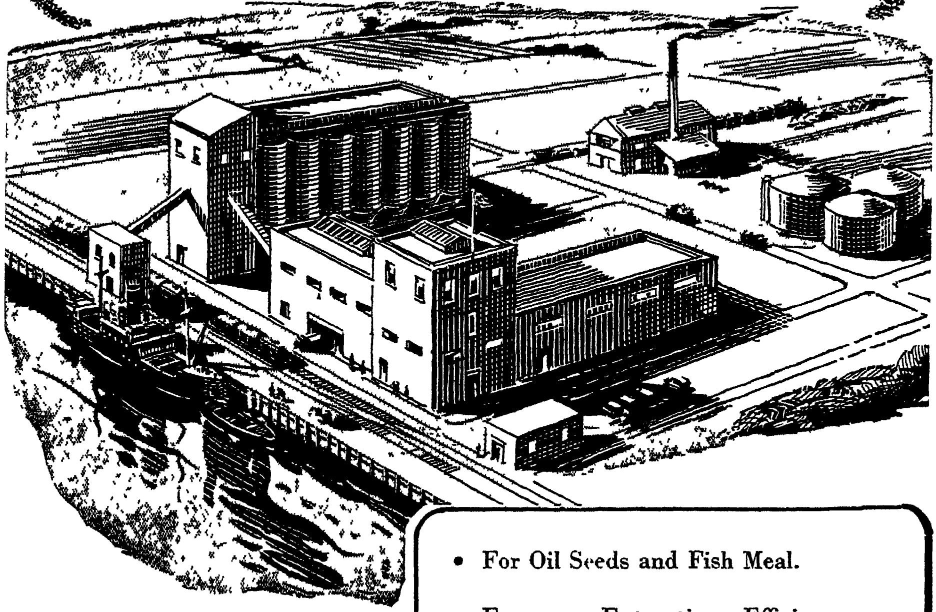

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Analytical Chemistry Congress

A REPRESENTATIVE gathering of chemists and others interested in the modern developments of analytical chemistry has met, under the chairmanship of Sir Robert Robinson, to consider the desirability of holding in Great Britain an international congress on the subject. A general committee and an executive committee have been formed to proceed with the organisation of this, which is planned for the summer of 1952.

A grant towards the preliminary expenses has been made by the Society of Public Analysts and Other Analytical Chemists, and it is hoped to have the support of the many other bodies to whom the development of analytical chemistry is vital. The honorary secretary of the proposed congress is Mr. R. C. Chirnside, research laboratories of The General Electric Co., Ltd., Wembley, Middlesex.

BWRA Number Changed

The telephone number of the British Welding Research Association has been changed to Langham 7485/9.

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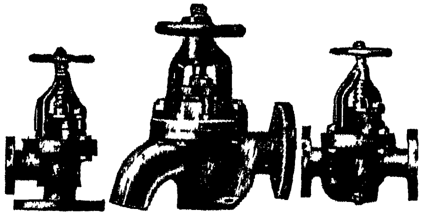

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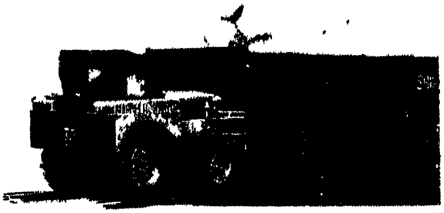

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Volume LXI 20 August 1949 Number 1571

Alkali Inspectors' Review

IN the absence of comprehensive periodical reports on chemical industry as a whole, of the kind which keep the country well informed of the fortunes of iron and steel production, the annual report of the Chief Inspector under the Alkali, etc., Works Regulation Acts serves as the most embracing summary available of the trend in affairs of a constantly widening field of chemical production. This recording service, which is called to mind once more by the current 85th annual "Report on Alkali, etc., Works," for 1948, is, of course, gratuitous and entirely incidental to the main purpose of the report. That is to record the progress of work done during the year by the two principal inspectors and five regional officers to minimise the release of dangerous or offensive emissions wherever specified chemical processes are carried on. While it appears to do that very adequately, the report repeatedly shows once again that the department has very little in common with a policing service, despite the fact that its vigilance is one of the essential safeguards against the creation of dangerous conditions in the vicinity of some chemical works, and that it takes wide view of its responsibilities for enabling chemical industries to develop economically and inoffensively. That is the characteristic which more than anything else must reconcile chemical managements to periodical visits by the alkali inspector and occasional demands for alteration of processes or equipment.

These people, unlike a rather large proportion of the officers who currently represent the administration in industrial affairs, are highly qualified, academically and in the practical affairs of the industry. The report leaves no room to doubt that those who compiled it are exceptionally well acquainted not only with the common sources of trouble between chemical operators and their neighbours but with the practical considerations of cost and shortage of certain supplies which must often determine what degree of improvement is possible. Because unreasonable demands are not made, this inspectorate has set up a tradition of good relations with the industry which has made much less onerous the joint responsibility of ensuring that chemical industries do not become "a reproach and a hissing."

The incidental function of reflecting what have been the changes in types and numbers of processes in the course of a year again brings to light a number of interesting data in the

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

current report. The number of works with which the inspectors were concerned last year was 1083, employing 1766 separate processes. This indicates that since 1947, 68 plants have closed or given up the type of production with which the Alkali Works regulations are concerned, and there are 77 fewer of the scheduled processes. (For historical purposes it is interesting to recall that when the first Alkali Act became law in 1863 it concerned in all only about 80 works.) The report goes on to show how this apparent loss to chemical production is accounted for and what has been the real effect. Most of it has been associated with by-products of coal carbonisation. Temporary cessation of benzol recovery, for example, eliminated 36 processes; the concentration of tar distillation at centralised plants brought to an end 19 others; and the abandonment of ammonia recovery disposed of 21 more. This "reduction," the report confirms, is only apparent. The inescapable need to centralise production into larger units has been narrowing the field, certainly since the present Act took effect in 1906. Then there were 1230 scheduled works operating 1830 processes, although the legislation covered a smaller field than it does now. "Although fewer works were registered," says the report, "this does not mean there has been any corresponding reduction in production. Indeed, speaking by and large, production in most branches of the heavy chemical industry is greater than at any previous time."

One of the most satisfactory evidences that the high productive level is being maintained is concerned with the sulphuric acid plants, whose output, exclusive of much of the yield from Government factories, is stated to have represented a rise of some 180,000 tons above the total produced in 1947. That is, of course, a direct reflection of corresponding widening of activity in numbers of other chemical industries, notably that responsible for chemical fertilisers. Heightened demand has produced one interesting result, reversing a trend which the report observes, has continued for some 20 years; 42.7 per cent of the 1,318,000 tons, calculated as 100 per cent acid, came from chamber process equipment, which

(*continued on page 242*)

Notes and Comments

An Inert Gas Compound

FROM time to time various claims have been made that compounds of the inert gases have been prepared. So far, none of them has been conspicuously substantiated, but a recent claim by Dr. H. M. Powell, of Oxford, and Dr. Mark Guter, of the British Oxygen Company, appears likely to withstand critical examination. Arising out of Dr. Powell's earlier work on clathrate compounds in which one molecular component forms an enclosing structure trapping the second component (for which the first need have little specific attraction) came the suggestion that if hydroquinone was crystallised from a solution saturated with argon at a high pressure some of the argon might be entrapped in the hydroquinone crystals. Experiments have fully confirmed this suggestion. Hydroquinone crystallised from benzene under 20 atm. pressure of argon was found to evolve considerable quantities of the gas when dissolved in water. This result is clearly of more than academic interest, as it opens up the possibility of a very convenient and simple method of storage, transport and dosage of the inert gas without the necessity for cumbersome steel cylinders or fragile glass containers.

Economic Crisis

A TIMELY statement on the economic situation existing in this country has been issued to its large membership by the Federation of British Industries, which expresses apparently justifiable concern at the grave danger of Britain being unable to obtain the food and raw materials it needs and utters a warning of the likelihood that we shall soon have to face further austerity and unemployment unless some prompt solution to our difficulties is found. Among the steps necessary to be taken, says the statement, is that taxation, and therefore Government expenditure, must come down, the high taxation which we now bear being itself a direct cause of high costs. Commenting on controls, the Grand Council of the FBI, which issues the statement, opines that the rigidity of the planning of our economic life should be relaxed. Controls, it says, have undoubtedly been reduced in number, but more could be abandoned. Price mechanism will, as it has in the past, apply the necessary correctives. The spur of competition is still the most effective aid to efficiency! We must concentrate on the things that matter. Such schemes as the nationalisation of iron and steel are irrelevant to our present crisis, distracting to those who should be concentrating on production and marketing problems, and damaging to our future prospects. Everyone engaged in industry must strain every nerve to cheapen methods of production, to abandon restrictive practices, and to adopt all possible aids to increased productivity, exhorts the FBI statement.

Sources of Shortage

NOTHING illuminates more revealingly the problem of manufacturers' inability to cut prices in obedience to the demand for continued expansion of overseas trade than the penetrating commentary offered each year by Sir Geoffrey Heyworth. As chairman of Lever Brothers & Unilever, Ltd., his speech to shareholders at the annual meeting of the company last week was necessarily concerned chiefly with oils and fats, but his analysis of the unbalanced distribution of raw materials which lies at the root of so many trading problems, was patently worth the attention of a very much wider audience. His views about bulk buying, by Governments or any other agencies, fully confirm what most people feel about this inelastic system, which seems to yield advantage to none in the buying country area and certainly does not produce cordial relations with the sellers. Sir Geoffrey Heyworth, however, is under no illusion that the present unbalanced state of essential supplies around the world can be righted by intelligent buying alone. His very expert analysis of oil and fats economics offered at least one reassuring note: world production has nearly regained pre-war levels. There should by now be sufficient for all, but for the estimated increase of 8 per cent in populations and the currency deadlock.

Colonial Minerals

THE survey undertaken by the Metals and Minerals Panel of the Colonial Primary Products Commission (No. 247, Colonial Office, 9d.) is a valuable and matter-of-fact report, even if it does belatedly underline the truism stressed in THE CHEMICAL AGE, March 5, 1949, that the present scarcity of geologists is a limiting factor in assessing the mineral wealth of the Colonial Empire. It is interesting to note that plant is being erected to double the present Northern Rhodesian output of electrolytically refined copper —now 60,000 tons per annum. This project will become a specially valuable dollar earner and so fulfil one of the major objects of the survey. If, however, the mineral resources of the Colonies are to be exploited, who is to supply the capital? Hardly the private investor who has always regarded money for mining purposes as being essentially risk capital. Over several decades the £260 million which it is estimated has been sunk in mines south of the Sahara has yielded an average of barely 4 per cent per annum. But there was always the possibility, no matter how remote, of a spectacular return which attracted speculators whose money and enterprise made London the world centre of mining finance. Under Socialism, even these ephemeral rewards are earmarked for the State. The successful mining of minerals depends ultimately upon an adequate and reliable labour force guided by an unfettered management. A combination of realism and imagination is required, but not of the kind that recently located phantom tigers in Africa in order to boost the achievements of an individual who saw none of the bogies conjured up by the Government department concerned. The Socialist state is not suited for the development of Colonial mining enterprises excepting perhaps in respect of minerals required of strategic importance that cannot be recovered economically. But the report under review specifically does not deal with minerals in this category.

ALKALI INSPECTOR'S REVIEW

(*continued from page* 240)

yielded only 40.2 per cent of the previous year's total. The contribution of the more widely used contact plant was correspondingly reduced, although its total yield was some 75,000 tons more. The size of individual chamber process works has been increased, for there were last year only 54 such works, contrasting with 92 in 1928. The revival of interest in chamber plant production, however, is unlikely to outlast the present need for acid and relative shortage of plant. In 18 instances the total acidity of emissions from such plants exceeded the statutory 4 gr., as SO_3 per cu. ft., while the average emission from contact plants was 3.28 gr., which was reduced to 1 gr. where washing equipment exists. The proper working of chamber plants demands continued skilful attention which, as the report observes, is not readily secured to-day.

In this, as in all the other departments they supervise, the alkali inspectors have shown a willingness to moderate their demands in the light of current needs and difficulties. At old contact acid works only escapes corresponding with more than 5 per cent of the sulphur burned are being regarded as infractions of the regulations.

METAL PRICE CHANGES

Aluminium Chrome and Steel

AN increase in the price of virgin aluminium in ingot form was announced by the Ministry of Supply as from Monday last (August 15). The price was raised from £90 to £93 per ton, delivered into consumers' works, with the addition of £2 10s. per ton for metal in notch bar form.

The new price will apply to metal of a purity of 99 per cent to 99.5 per cent inclusive, and the existing premiums for higher purities will be payable in addition as follows:—

	Purity	*Premium per ton*
Minimum	99.6 per cent	£8 0 0
,,	99.7 ,, ,,	£12 0 0
,,	99.8 ,, ,,	£17 0 0
,,	99.9 ,, ,,	£50 0 0
,,	99.99 ,, ,,	£100 0 0

The change is stated to be due to a rise in the average cost of current supplies.

A reduction in the selling price of Baluchistan chrome by 10s. per ton, was also announced by the Ministry of Supply, effective from the same date (August 15).

The new price is £11 1s. 9d per ton delivered direct ex ship, and £11 17s. per ton for deliveries ex store, and includes carriage charges to railpoint nearest to consumers' works.

The decrease follows reduction in the freight rates from India.

Maximum prices of certain iron and steel products were altered as from Tuesday last (August 16), by an Order made by the Minister of Supply.

Principal alterations were:—(1) Reductions in the prices of galvanised sheets. tubes, wire nails, terneplate and alloy steel black bars, and (2) an increase in the price of alloy steel bright bars.

Copies of the Order—the Control of Iron and Steel (No. 73) Order, 1939—can be obtained from H.M. Stationery Office or from any bookseller.

Scottish Steel Record Anticipated

SCOTTISH steel production, which set up new high levels for the first six months of 1949, is expected to reach a record total of almost 2.5 million tons in 1949. The steel industry's only fear, a shortage of fuel. is offset by the fact that stocks of coal are better than they were a year ago. Supplies of ore, limestone, and other materials have also improved.

SCIENTIFIC FILMS

Brussels Congress and Festival

DELEGATES from many countries will discuss various aspects of the importance of scientific films when the Third International Scientific Film Congress meets in Brussels during September 30-October 5.

Among the reports presented by sub-committees will be one on a standard method for cataloguing and recording information about scientific films and another on customs regulations in relation to their international exchange.

A festival of scientific films will be held in conjunction with the congress. This will include four public sessions with films dealing with research, education, and scientific documentary. There will also be an exhibition of medical films, for doctors, students, and others who have interests in medicine.

Four sessions covering research, industry, education and medicine will be reserved for specialists.

The Scientific Film Association of Great Britain is considering the films to be submitted as the British entry in the festival and wishes to hear of privately produced films which would be suitable for inclusion.

INDUSTRIAL SAFETY

THE safe use of solvents, installation and maintenance of breathing apparatus, and the use of electrical apparatus in hazardous atmospheres, are among the subjects to be discussed at the residential conference which will be held at Scarborough from October 7-9.

The conference is being organised by the Royal Society for the Prevention of Accidents on behalf of the Association of British Chemical Manufacturers. It will be on similar lines to the safety conference held at Harrogate last year, and although mainly devoted to chemical aspects, will be of general interest to other industries.

Sir Harry Jephcott (Glaxo Laboratories, Ltd.), will open the conference. Other speakers will include Dr. A. J. Amor (president, Association of Industrial Medical Officers), Mr. T. Senior (Imperial Chemical Industries, Ltd.), and Mr. S. W. Richards (General Electric Co., Ltd.).

The programme will include a Brains Trust at which Mr. H. R. Payne, chairman of the works safety committee, ABCM, will act as question master.

Basic Chemicals in May

Little Change in Production and Consumption Levels

LEVELS of production, consumption and stocks of some basic chemicals remained steady in May, and there was little change noticeable by comparison with May, 1948.

Estimated numbers employed in the chemical and allied trades rose slightly to a total of 432 thousand, the same as in March this year. Distribution of workers (in thousands) was as follows: coke ovens, chemicals and dyes, and explosives 249.6 (183.0 men, 66.6 women); paints and varnishes 37.6 (26.3 men, 11.3 women); oils, greases, glue, etc., 64.0 (50.9 men, 13.1 women); pharmaceutical, toilet preparations, etc., 80.8 (40.9 men, 39.9 women).

These figures and the representative tables given below are contained in the latest issue of the *Monthly Digest of Statistics* No. 43, July (HMSO, 2s. 6d.).

	May, 1949 Thousand Tons			May, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	137.4*	139.0	—	127.4	125.0	–
Sulphur	—	25.3*	94.6*		21.7*	86.6*
Pyrites	—	18.1*	71.0*		18.3*	71.0*
Spent oxide	—	16.3*	171.6*	-	15.4*	166.7*
Molasses (cane and beet)	10.9	24.5†	283.5	11.3	24.9	198.4
Industrial alcohol (mil. bulk gal.) . .	1.77	1.94	4.9	1.65	2.28	6.46
Superphosphate	17.6	14.4	—	18.3	15.2	-
Compound fertilisers	(No figures available)			100.1	80.0	
Liming materials	—	537.7	—	-	450.8	
Ammonia	—	6.8*‡	5.91	-	6.36*‡	5.24
Phosphate rock	(No figures available)				79.7	194.2
Virgin aluminium	2.68	15.6	—	2.51	12.1	–
Virgin copper	—	25.8	117.5	—	28.9	90.1
Virgin zinc	—	14.3	60.7	-	17.9	47.6
Refined lead	—	13.8	46.7	—	16.3	32.4
Tin	—	1.7	20.4	—	2.15	13.2
Zinc concentrates	—	14.4	28.0	–	14.9	63.0
Magnesium	0.55	0.43	—	0.18	0.19	—
Pig iron	186.0*‡	—	303.0*	181.0*‡		190.0*‡
Steel ingots and castings (including alloys)	301.0*‡	—	1,121.0	297.0*‡		846.0
Rubber: Reclaimed	0.43	0.38	3.83	0.54	0.49	3.89
Natural (including latex)	—	3.65	46.0	–	4.22	137.9
Synthetic	—	0.07	1.86	-	0.05	2.02

* June. † Distilling only. ‡ Average of five weeks.

A WARNING ON POLONIUM RADIATION RISKS

THE danger associated with the casual use of static eliminator devices made of polonium is emphasised by a warning recently issued by the University of California's atomic energy project, Los Angeles.

Based upon a survey by Bryan and Silverman, of the university's medical school atomic research group, this report points out that serious radiation hazards may develop in the area around the devices which have been produced to eliminate static charges through the employment of thin strips of the element polonium.

Polonium, used commercially, is effective in eliminating static electricity produced by belts and pulleys, paper passing over metal rolls and other machinery. It emits alpha particles to form a conductive layer of ionized air between the dielectric material and a portion of the machine which is grounded. A survey of industrial plants in the Los Angeles area has revealed dangerous radioactivity in the area in which static eliminator devices were stored.

The radiation of polonium, Dr. Bryan points out, does not penetrate the skin, but an internal hazard may develop from radioactive particles absorbed by inhalation or hand-to-mouth contact. The report recommends such static eliminators be used only when suitable monitoring instruments are available and workers are properly trained to handle radioactive material.

CHEMICALS IN DAILY LIFE

Service in Home and Industry

A FURTHER example of enterprise by Monsanto Chemicals, Ltd., in attempting to make sure its workers and others have a clear picture of the part played by its chemical products in everyday life, was a "Meet Monsanto" exhibition at the Congregational chapel hall in Cefn Mawr, some two miles from Ruabon.

The exhibition included a special display of the new development manufactures, Syton, Santomerse and petroleum chemicals, with an almost full range of samples of all the Monsanto chemical products. There were also parallel exhibits of consumer goods in which these chemicals are embodied, showing their many applications in daily life both at home and abroad.

A display of excellent photographs showing activities at the Ruabon plant and other factories in industry where Monsanto chemicals play some important part in manufacturing processes, attracted much attention.

By way of an original "guide" to the exhibition the company issued an entertaining booklet showing some of the ways in which Monsanto products affect the home.

REMOVABLE WALL COATING

Protection of Laboratories

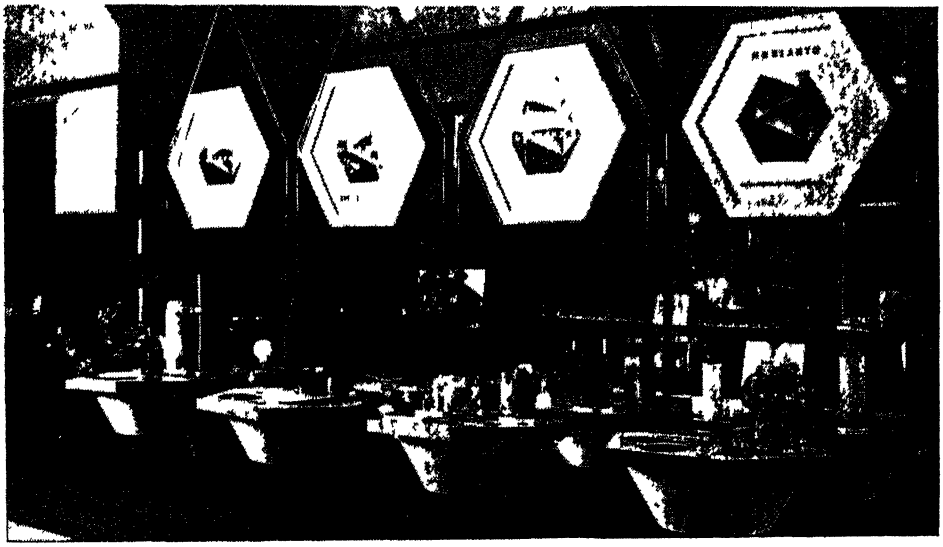
WHAT is believed to offer a partial solution of the most serious health hazards of atomic research—radioactive pollution of laboratories and factories—is reported by Dr. A. Carleton Jealous, a chemical engineer of the Oak Ridge National Laboratory, Tennessee, U.S.A.

Experimental use of a removable plastic wallpaper is described in the report, which summarises the conclusions of a large number of scientists and engineers engaged in the development of atomic energy.

Easy to Strip Off

Laboratory units have been covered with three coats of dense paint known as Prufcoat, over which is sprayed a thin rubbery film called Cocoon. It is expected that this type of coating will make it possible to strip off contaminated sections of the outer wall coating and replace them with new layers.

To complete the work, for a small unit, this method takes 48 man-hours, requires five days for drying, and costs about $155, Dr. Jealous states. It would, however, obviate the necessity of employing labour for scouring porous concrete walls to eliminate absorbed radioactive materials.



Some of the development products seen at the "Meet Monsanto" exhibition, at Cfn Mawr. These include sodium benzoate used for medicinal, food, and industrial purposes; Santomerse No. 1, a modern all-purpose detergent and wetting agent, and Syton, an anti-slip agent used in the initial preparation of wool fibres

LESSENING ATMOSPHERIC POLLUTION

Progress Report by the Alkali Inspectors

THE considerable widening in recent years of the duties undertaken by the inspectors appointed under the Alkali, etc., Works Regulation Act and the subsequent Works Orders continued during 1948, as is shown in the current 85th report of the chief inspectors (SO, 32-1-0-48; 9d.).

The work of ensuring that the emission of toxic or offensive fumes or gases, etc., is kept to the practicable minimum has latterly involved close attention by the chief and deputy inspectors (Mr. W. A. Damon and Dr. J. S. Carter) and the six regional officers to a variety of plants with which in the past this department was not concerned. Of a total of 3772 inspections carried out during 1948, 524 visits were to processes not covered by the Alakali Acts, notably to electricity undertakings and similar large-scale steam raising installations, the smoke and dust producing capacity of which has latterly received very critical attention. It is significant that, of 80 complaints made to the inspectors, 40 related to unregistered processes.

Metallurgical Furnaces

The other section of unregistered processes to which the inspectors have given much attention is represented by metallurgical furnaces, in relation to which the inspectors have in a number of instances provided technical advice enabling the discharge to the atmosphere to be minimised, often with beneficial recoveries or economies of process materials.

Summarising the evidence obtained during the year's inspection of processes scheduled under the Act and its additions, the chief inspector records that there was again only one instance of escape of hydrochloric acid gas in excess of the limit prescribed in Section I of the Act (0.2 gr. HCl per cu. ft.), but in 18 cases emissions from sulphuric acid works exceeded the prescribed limit of 4 gr. SO_3 per cu. ft. In no case has it been necessary to institute legal proceedings, and throughout the report there is renewed evidence that the inspectorate and the industries have collaborated on very amicable terms to ensure that chemical processes were carried out " by the best practicable means." It is apparent that full allowance has again been made for the practical difficulties in ensuring the trapping of offensive matters imposed by the continued shortage of certain forms of chemical and industrial equipment.

The alkali works, for which the Act was originally designed, are shown to have maintained a high standard of recovery. Report is made of only one breach of the regulations, in a newly registered saltcake works, and this is regarded as having been only a technical offence. Some leakage of gas into the fire flues produced on one occasion a concentration of 0.4 gr. HCl per cu. ft. In general, says the report, the operational standard has been good.

Chlorine is occasionally found in small amounts in the waste gases from alkali processes and various theories, e g., presence of manganese compounds have been put forward to explain its occurrence. At one works small quantities were being formed within the furnace. No satisfactory explanation has as yet been found although the opinion has been advanced that the asbestos with which the rabble arms are covered is having some catalytic effect.

Of sulphuric acid production, the report records that up to last year there had been a steady decline in the proportion of sulphuric acid made by the chamber process for the past 20 years, but the total amount had remained fairly constant at about 500,000 tons (as 100 per cent acid) annually. The size of individual works had however increased, the same production being achieved at 54 works in 1918 as at 92 works in 1928.

Even with the substantially increased capacity which will be provided by new plants due to come into production in 1949, it seemed likely that the demand would outstrip supply for some time to come.

Sulphuric Acid

During the year 18 instances were recorded when the total acidity of escapes were found to be in excess of the statutory 4 gr. as SO_3 per cu. ft. and the average of all escape tests made was a trifle higher than that of last year. The inspectors record that it was generally found on their arrival at works that steps had already been taken to rectify high escapes and that plants were consequently reverting to normal conditions.

A matter of some interest which may have an influence on the design of sulphuric acid plants is the installation of a

Katchkaroff plant on a pilot scale at one of the London works inspected. This is an intensively working unit which occupies less space than chamber, or even tower, plants of equal production capacity. Plants are known to be in satisfactory operation abroad, using pyrites. In the London works it is proposed to burn native spent oxide. The nitre consumption and the exit gas are reputed to be exceptionally low.

Of the contact acid production plants, the report discloses that the average of all official tests on escapes from plants was 3.28 gr. as SO_3 per cu. ft. The average at plants where washing is practised was 1.0 gr. and at the remainder 4.3 gr. While this cannot be considered satisfactory, it must be remembered that the demand for acid has led to rather intensive working which, of course, is not favourable to the maintenance of low escapes.

The advantages of operating a four-pass converter, such as that employed in June in one plant for the first time are recorded. Here the average total acidity of the escape had been below 2.0 gr. per cu. ft., which is equivalent to less than 2 per cent of the sulphur burned. It was unfortunate that for some reason not yet established, the escape was misty and had a tendency to drift to ground level. Complaints of choking fumes had been made in the neighbourhood.

Although it had been thought reasonable to specify that escapes from new plants should correspond to not more than 2 per cent of the sulphur burned it has been appreciated that such an efficiency is not to be expected in the case of the older plants. District inspectors have therefore been instructed to regard as infractions of the Act only such escapes at old works as correspond to more than 5 per cent of the sulphur burned.

Treatment of Catalysts

The inspectors have been able to offer some technical reminders, based on their observations of causes of unsatisfactory operation, relating to the treatment of catalysts. It is pointed out that, restarting plants which have been idle, if the temperature of the catalyst has fallen below its ignition point (usually just above 400° C. in the case of vanadium catalyst) it should be raised gradually by the alternate combustion of oil in the sulphur burner and the blowing of hot air through the convertors. Sulphur dioxide should never be passed through a convertor before the temperature of the catalyst has been raised above its ignition point.

From time to time it is necessary to remove the catalyst for screening so as to free it from dust. It is a great advantage to add a few inches of new mass after the old screened mass has been replaced, because it is known that the ignition temperature tends to rise with continued use.

The report pays recognition to the increasing importance of chemical fertiliser plants, about which it notes that the number of works registered in 1948 was 34, compared with 41 in 1938, 75 in 1928, and 128 in 1920. Production of superphosphate was, however, greater than at any time—about one million tons per annum compared with half a million tons ten years ago. There has been an appreciable concentration of production at fewer units. The great bulk of superphosphate was now made in continuous mechanical dens and mixers. More granulating units had come into operation and at least two plants for the production of triple superphosphate were under consideration.

Superphosphate Works

Although there had been some improvement, the position at superphosphate works was not yet entirely satisfactory The average acidity of the escapes, 0.12 gr. per cu. ft. calculated as the sulphur trioxide equivalent of hydrofluosilicic acid, was lower than the 1947 figure, 0.15 gr, but higher than the pre-war figure of 0.06 to 0.08 per cu. ft. The acidities were admittedly small, but the aim at superphosphate plants had always been to reduce the acidity to the lowest possible figure.

The acid gases evolved in the production of superphosphate were readily removed by scrubbing, but the need for increased production had caused some neglect of scrubbers and sprays.

No serious criticism is offered of the general standard of operation of nitric acid, chlorine and muriatic acid plants.

The sulphide processes cover one of the widest fields of production with which the inspectors were concerned and it was observed that the hydrogen sulphide released from the various works varied from almost pure gas to concentrations of only parts per million. These emissions were liable to be contaminated with organic compounds. The department was still intent on eliminating hydrogen sulphide from all such emissions and the means generally being employed were regarded as satisfactory, except in viscose works.

Progress in the installation of remedial plant at viscose works was disappointing. Waste gas treatment involves appreciable capital and running costs, difficulties had

(continued overleaf)

Ceylon May Produce Rubber

Reaction to Market Difficulties

THE Conversion of raw rubber in Ceylon to processed goods of higher value for which there is relatively much wider demand is advocated by the rubber technologist of the Ceylon Ministry of Industries, Dr. A. Sunderalingam, as the only hope for the survival of the local rubber industry.

He estimates, however, that only 5000 tons per year of Ceylon's annual rubber output of 90,000 tons can be used for the local manufacture of goods within the next five years.

Laboratory and pilot factory experiments so far have indicated that Ceylon rubber is convertible to many higher-priced types of processed rubber. The types which have been subjects of experiment were softened rubber for the production of smoked sheets, carbon black rubber, nitrate crumb, rubber powder designed on the lines of the patented stamp process, and concentrated latex. Concentrated latex is produced in three forms—the Revertex concentrated form of latex, centrifuged rubber and creamed latex.

The production of latex crêpe (pale crêpe) and sole crêpe offers promising commercial prospects. This white or near-white product has no substitute in the synthetic field which lends itself so readily to successful colour tinting. Chemical rubbers, such as chlorinated rubber used on roads and in the preparation of paints, and rubber hydrochloride, also command a world market, states Dr. Sunderalingam. Rubber hydrochloride, of which Pliofilm is a successful example, has a variety of commercial uses. Ceylon, says Dr. Sunderalingam, can make effective use of this cellophane-like product in packing tea. It will guarantee complete preservation and at the same time leave the selling commodity visible.

The conversion of raw rubber to these marketable processed types, Dr. Sunderalingam points out, is a task in which the Government and planting and commercial interests should collaborate. He does not exclude the incorporation of foreign commercial interests, which will also mean the inflow of foreign capital to finance the enterprises.

The difficulty of ensuring a regular supply of latex is the main cause for the delay in establishing the proposed Government rubber crêpe factory. It has been estimated that the factory will need at least 1000 gal. of latex a day if it is to be an economic proposition.

In the event of the Government failing to obtain a regular contractor for the latex, it is likely that a factory for the production of rubber seed oil and softened crêpe will be established on the site selected for the crêpe factory.

LESSENING ATMOSPHERIC POLLUTION

(*continued from previous page*)

been experienced in obtaining constructional materials and there had been a general shortage of caustic soda. Simple scrubbing with caustic soda had been shown to give extremely effective removal of hydrogen sulphide.

The method had the disadvantage that it involves some wastage of soda in the removal of carbon dioxide and a sulphide effluent disposal problem. Tests were being made to apply the Courtauld catalytic scrubbing method (described in the 82nd Report).

The practice of de-gassing spinning room acid with absorption of the evolved hydrogen sulphide in caustic soda continued to spread. This was all to the good, but was not sufficient by itself and in due course all works would have to employ suitable methods for the treatment of the main volume of waste gases.

While the recovery of benzol at gas works had been on a diminished scale—there were 36 fewer works in 1948—the inspectors found cause for complaint in the operation of several of the existing plants.

In one instance a new plant had been brought into operation without any provision being made for dealing with uncondensed gases. The works management and the contractors who built the plant were equally to blame for this singular omission for both should have been aware of the obligation to provide the proper means, says the report. On the matter being brought to the owner's notice, a connection to the gas exhausters was immediately made which allowed the uncondensed gases to be drawn into the main gas stream.

APPLIED SCIENCE AND ENGINEERING

Some Notable Displays at Olympia

THE Engineering and Marine Exhibition, incorporating the Welding Exhibition, which opens at Olympia, London, on Thursday next (August 25) and continues until Saturday, September 10, promises to provide a very representative review of what has lately been achieved in adapting to contemporary needs designs in chemical and metallurgical processing plant, automatic and metering devices and power raising equipment.

The exhibition is being held with the active support of the British Engineers' Association, the Society of Motor Manufacturers and Traders (Marine Section), the British Electrical and Allied Manufacturers' Association, the Institute of Welding, and the British Acetylene Association.

The following particulars of some of the exhibits supplied by participating firms provide a pointer to characteristic modern developments.

Among the exhibits of scientific instruments, research equipment, etc., are the following:—

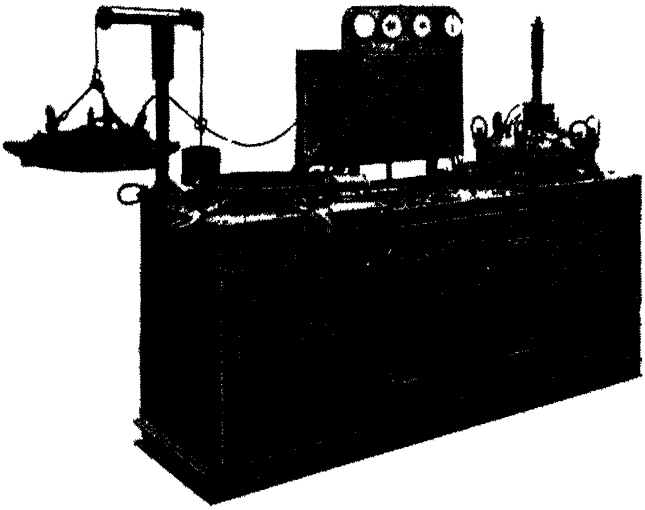
The Accurate Recording Instrument Co., Morden, Surrey. (Stand 1, Row S, Ground Floor, National Hall.)—The display here includes representative examples of the firm's manufactures in dial thermometers, in remote-reading and rigid stem types, temperature indicators and controllers, temperature recorders, tank gauges, vacuum recorders, and other instruments.

Barlow-Whitney, Ltd., London. (Stand 8, Row C, Ground Floor, Grand Hall.)—The specialities exhibited by this company cover a wide range of electrically heated plant and apparatus for industrial processes in the chemical and a number of other trades, including vacuum and pressure impregnating plants, hardening and annealing furnaces, and tanks for plastic dip coating processes.

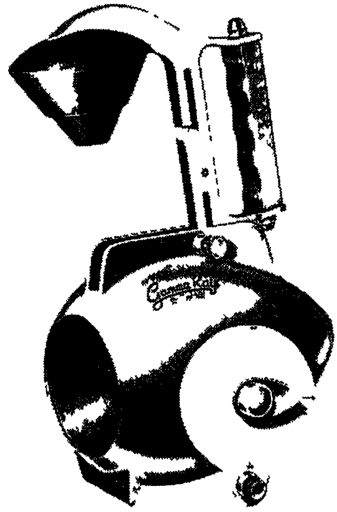
Bayham, Ltd., London. (Stand 50, Inner Row, Grand Hall Gallery.)—Among the dial type liquid level indicators being shown one of the more interesting features is the magnetic coupling between the operating float gear and indicating pointer. Indicators are available in dial diameters of from 2 in. to 15 in.

The British Rototherm Co., Ltd., Merton Abbey, London. (Stand 17, Inner Row, Grand Hall Gallery.)—Outstanding characteristics of the dial type thermometers exhibited by this firm are their robustness and the facility with which they can be read. Also shown are temperature gauges applicable to exhaust gas, lubricating oil, etc., and a number of special purpose instruments.

Commercial X-Rays, Ltd. (Stand 53,



Barlow-Whitney vacuum and pressure impregnating plant. A special feature is that it is completely self-contained and occupies a minimum of floor space



Gamma-ray operating container for radium, radon seed, etc., open during exposure

Gallery.)—Represented here are the activities of two associated companies, both engaged in non-destructive examination of all metals in the form of castings, forgings, welding and welded fabrications. A new facility is the welders' testing service which offers a free test of 12 in.-15 in. specimen welded test pieces up to 2½ in. thick. Now that the Government is making radium and radon seed sources available for industry, Gamma-Rays, Ltd., will advise industrialists on the form and strength of element most suited to their particular application.

The Department of Scientific and Industrial Research, London. (Stand 3, Row U, Ground Floor, Empire Hall.)—On this stand are demonstrations by scientists of the latest items of research apparatus being currently used. The exhibit as a whole demonstrates the importance which is attached to research by British industry, and the manner in which the applied scientist is co-operating with the engineer in maintaining industrial efficiency and the quality of British products.

Evershed & Vignoles, Ltd., London. (Stand 6, Row Q, Ground Floor.)—A simple pilot plant has been installed to demonstrate the company's most recent developments in process control apparatus. Instruments for distant indication and control, and electric salinometers are also on view.

The Morgan Crucible Co., Ltd., London. (Stand 12, Row E, Ground Floor, Grand Hall.)—The exhibits here include many types of crucibles, a power tilting lip axis pouring crucible furnace and a wide range of "Morganite" carbon engineering components for many industries.

Negretti & Zambra, Ltd., London. (Stand 4, Row H, Ground Floor, Grand Hall.)—A comprehensive range of industrial and scientific instruments is shown, including mercury-in-glass and mercury-in-steel thermometers, temperature recorders and controllers, thermo-hygrographs, and liquid level and humidity controllers for a variety of industrial processes. Claimed to be particularly accurate and robust, these instruments are guaranteed for two years.

Chemical Glassware

Pilkington Brothers, Ltd., St. Helens. (Stand 8, Row P, Ground Floor, National Hall.)—This exhibit demonstrates, among other things, the wide scope of glass as a material in industrial and chemical engineering, and includes examples of built-up glass tanks, also platen plate for use with rubber and plastic presses.

Sharples Centrifuges, Ltd., Stroud, Glos. (Stand 5, Row D, Ground Floor.)—Two types of Sharples laboratory supercentrifuges which have been widely adopted for research and industrial laboratories are among this company's exhibits. The open model is useful for experimental sedimentation, separation and clarification processes. The Presurtite machine, totally enclosed, is designed for the sedimentation of viruses and treatment of toxic materials.

Spirax Manufacturing Co., Ltd. Cheltenham, Glos. (Stand 23, Row GG, First Floor.)—Among its full range of steam trapping, air venting and allied products, particular attention is being given by this firm to Spirax methods of improving heat transfer in steam-heated plant, and the recovery and use of flash steam. Another feature will be the Sarco external temperature operated controller for accelerated hot-water heating systems.

Vokes, Ltd., Guildford. (Stand 5, Row E, Ground Floor, Grand Hall.)—Examples are shown of this firm's filters for air, oil, various fuels, air conditioning, compressed air, gases, etc. There is also a fully mechanised working model of the Vokes dust recovery filter unit for the recovery of valuable dusts in industry.

The following are among the exhibits of chemical manufacturers and allied firms:—

Albright & Wilson, Ltd., London.

(Stand 44, Gallery.)—The stand is divided into two parts, one showing displays of water treatment, and the other some of the many products which incorporate silicone chemicals. The service of sodium phosphates and sodium metaphosphate (Calgon), used in treatment of boiler feed and cooling water to prevent scale formation and corrosion, is also demonstrated. Many versatile silicone products are now commercially available including silastic rubber, which remains serviceable over a wide range of temperatures.

THE CHEMICAL AGE will be represented on STAND 21, Inner Row, National Hall Gallery, where all the industrial publications of Benn Brothers, Ltd., will also be available

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Fletcher, Miller, Ltd., Hyde, Cheshire. (Stand 7, Row AA, First Floor, Empire Hall.)—This firm is exhibiting examples of metal cutting oils, including soluble types, also Rodol rust preventatives in 18 liquid and solid grades, and the Solvex degreaser and cleaner.

Rozalex, Ltd., London. (Stand 54, Gallery.)—This display shows a full range of preparations which provide protection against industrial irritants capable of causing skin trouble. The Rex dispenser, which ensures controlled distribution and an uncontaminated supply of Rozalex to each person, is also on view.

The following are among the representatives of the chemical engineering and allied industries:—

Crossley Brothers, Ltd., Manchester. (Stand 4, Row G, Ground Floor.)—A wide range of engines suitable for marine or industrial application is displayed. Numbers of HRL and ERL types have been installed in the heavy chemical and oil industries.

G. A. Harvey & Co. (London), Ltd., London. (Stand 8, Row M, Ground Floor.)—Exhibits cover a wide range of products for petroleum refinery plant for which the company is now the approved manufacturer to the American API/ASME code, enabling it to compete with American concerns for export orders. "Harco" perforated metals suitable for filtering and grading such diverse materials as coal, cereals, food products and chemicals are also shown.

Sigmund Pumps, Ltd., Gateshead. (Stand 10, Centre Row, National Hall Gallery.)—Here are examples of "Sigma" process pumps from the series of over 80 types now in use in many oil refineries and chemical works.

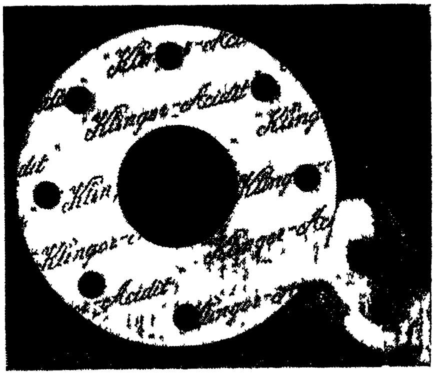
Richard Klinger, Ltd., Sidcup, Kent. (Stand 1, Row C, Ground Floor.)—Among the specialities displayed is the "Klinger-Acidit" acid resisting jointing produced to meet the requirements of the chemical and engineering industries engaged in the manufacture, use, storage, and transport of concentrated acids.

The Saunders Valve Co., Ltd., Cwmbran. (Stand 8, Inner Row, Grand Hall Gallery.)—Shown here is a full range of diaphragm valves for all fluids, from water to the most active acids, and corrosive and abrasive liquids generally. Also shown are representative examples of this firm's Safran centrifugal pumps.

There are several exhibits of plastics interest.

Ashdowns, Ltd., St. Helens. (Stand 20, Outer Row, Grand Hall Gallery.)—Here are shown plastic mouldings in thermo-setting thermo-plastic materials, extrusions in PVC, synthetic resin bonded paper base mouldings for refrigerators, etc., and synthetic resin bonded boards for electrical insulation and mechanical applications. Also exhibited are examples of silicone bonded glass fabric laminated board for high-temperature electrical insulation.

R. H. Windsor, Ltd., London. (Stand 10, Row Q, Ground Floor, National Hall.)—The principal interest of this exhibit centres in the several thermoplastic injection moulding machines to be seen at work, from 10 gm. to 16 oz. hand or hydraulic operation, and automatically controlled cycle, for moulding a wide range of thermoplastic materials. There



Acid-resisting jointing by Richard Klinger, Ltd.

are also on view extrusion machines for cellulose acetate, PVC, etc.

In the welding section, the following are representative exhibits:—

Murex Welding Processes, Ltd., Waltham Cross, Herts. (Stand F11, Ground Floor, Grand Hall.)—Practical demonstrations of new developments are being given, among the exhibits being the latest type of Murex 300/400 amp. Diesel engine-driven equipment fitted with a new cartridge starter. New electrodes will be demonstrated from the firm's wide range, which includes types for the welding of mild steel, high tensile steels, heat resisting steels, non-ferrous metals, cast iron, and for hard facing applications.

Philips Electrical, Ltd. (Stand G16, Ground Floor, Grand Hall.)—A special range of arc welding equipment, magnetic filters, and battery chargers is being displayed by the company's industrial department. An interesting feature is the new Motronic equipment which facilitates automatic control where quick response to changing requirements from electrical motors is necessary, and there is a useful show of X-ray equipment designed for the industrial user.

Rockweld, Ltd., Croydon. (Stand F14, Ground Floor, Grand Hall.)—This display includes equipment for the fabrication of plastic materials by welding and typical products. The exhibit is in collaboration with The Chemical Pipe & Vessel Co., Ltd., whose range of productions on view includes pipe lines of all bores, tubes up to 36-in. bore, tanks up to 500 gal. capacity, chemical drains, etc., made of polythene.

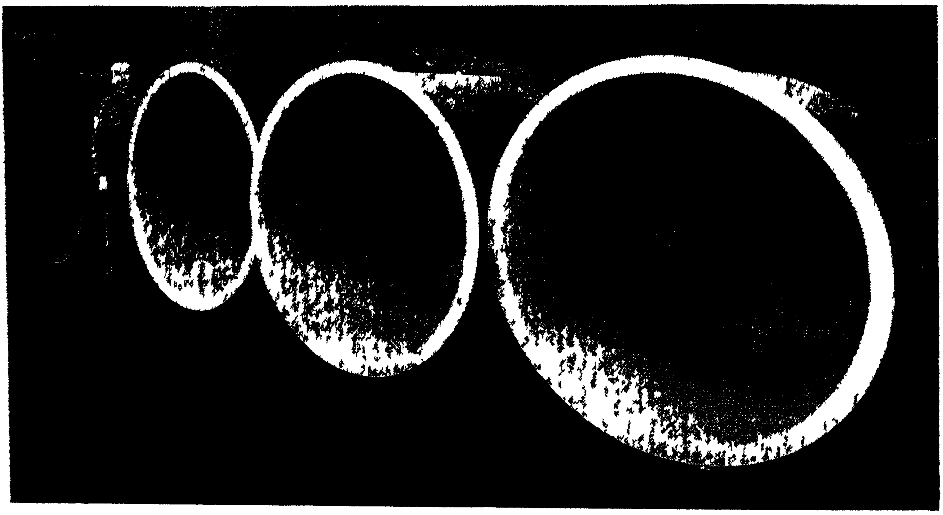
Non-ferrous metals are represented by a number of exhibits, typical among which are:—

Almin, Ltd., Farnham Royal. (Stand 2, Row R, Ground Floor, National Hall.) —Shown here are many examples of aluminium alloys in ingot, semi- and fully-manufactured forms. The Almin (Associated Light Metal Industries) advisory bureau will answer queries regarding the use and application of aluminium alloys.

The Aluminium Development Association, London. (Stand 8, Outer Row, National Hall Gallery.)—Members of the association's technical staff are in attendance and are available for consultation on problems affecting construction, engineering, and the behaviour of aluminium under many conditions.

The British Aluminium Co., Ltd., London. (Stand 5, Row V, Ground Floor, Empire Hall.)—The application of medium and high strength aluminium alloy plate to large scale and structural engineering projects is emphasised on this stand.

I.C.I., Ltd., Metals Division, Birmingham. (Stand 8, Inner Row, National Hall Gallery.)—Here are many examples of sheet, strip, tubes and extrusions in copper and copper base alloys, and aluminium alloys, etc., in a wide range of applications.



Mild steel tanks lined with polythene moulded sheet, each of 500 gal. capacity, made by The Chemical Pipe & Vessel Co., Ltd.

ORGANIC SEQUESTERING AGENTS

Some New Industrial Applications

From A CORRESPONDENT

CERTAIN complex organic compounds, notably ethylene bis-iminodiacetic acid, act as a water-soluble ion-exchange or water softener, and also have the ability of solubilising normally insoluble metallic and rare earth ions to form stable chelate complexes. This action is frequently known as "sequestering" and the chemicals responsible for it are referred to as "sequestering agents."

It is, of course, well known that some of the polyphosphates possess marked sequestering properties, but for certain applications the organic compounds are preferable. For example, unlike the phosphates, the organic sequestering agents form complexes with calcium salts, which can be boiled or stored indefinitely in aqueous solution without breakdown; moreover, the organic calcium complex is stable in aqueous sodium hydroxite at a strength of 10 per cent.

Because of this high stability at elevated temperatures, and in the presence of strong alkalis, ethylene bis-iminodiacetic acid and its salts are now being recommended for use in alkali metal cleaner baths. For this purpose, the polyphosphates, with their limited stability at high temperatures and high alkalinity. are often unsuitable. The organic sequestering agent is not only unaffected under these conditions, but it prevents the precipation of calcium phosphates, silicates and carbonates which will contaminate a metal surface whenever hard water is used.

Chelate Complexes

The ability of ethylene bis-iminodiacetic acid to form stable and soluble chelate complexes with divalent and trivalent metallic ions is of considerable importance; for example, one mol. of the acid (292 gm.) will bind a maximum of one gm. ion of a divalent metal. This peculiar property can be exploited to good purpose in plating operations where metal complexes with the organic acid can often replace the cyanides and offer the advantages of freedom from any health hazard, stability, ease and safety of processing with ordinary tap water, and improved adhesion and brightness of the deposited metal surface.

Considerable research and development work on sequestering agents has been carried out in the U.S.A., and U.S. Patents 2,130,505 and 2,240,957 describe methods of manufacturing polyaminocarboxylic acid derivatives, of which ethylene bis-iminodiacetic acid is the most important. This acid, which is known in the U.S.A. as Sequestrene, is available as a white, free flowing non-hygroscopic powder. It is sparingly soluble in hot or cold water and in the common organic solvents. It dissolves in aqueous solutions of bases to form alkali metal, ammonia and amine salts.

The acid may be converted to the tetrasodium salt merely by dissolving it in an aqueous solution of sodium hydroxide.

The pH of a saturated solution of ethylene bis-iminodiacetic acid is 2.8, while the di-, tri-, and tetrasodium salts have pH values in 1 per cent solution of 4.8, 8.8, and 10.5 respectively.

Solubility

The solubility of the di-sodium salt is about 3 per cent in water; the neutral and alkaline salts are highly soluble. These salts are insoluble in alcohol, but will dissolve in iso-propanol alcohol containing 10 per cent or more of water.

In addition to these normal salts, the organic sequestering agent forms a series of inner salts or chelate complexes which, unlike most other chelate-forming compounds, are water-soluble substances of high stability. The di-sodium salt of the calcium complex of ethylene bis-iminodiacetic acid is highly soluble in water and insoluble in organic solvents, and when tested it does not give any of the usual analytical tests for calcium. The addition of oxolate, soap, phosphate, hydroxide or carbonate causes no precipitate of calcium. This is clear evidence that the calcium in this salt is not ionised, but is part of a water soluble anion. At neutral and alkaline pH values, one part of ethylene-bis-iminodiacetic acid will sequester or bind about 0.12 parts of calcium in the presence of oxalate or soap, but the pH is lowered the stability of the organic calcium complex decreases and the calcium is progressively released in its ionised form.

The ability of ethylene bis-iminodiacetic acid to form stable and soluble complexes with metallic ions has already been noted.

One of the most important applications of organic sequestering agents is in textile dyeing, where it is known that the presence of calcium, magnesium, iron, copper, tin and other metals is liable to cause faulty dyeing. Such defects as streaking, spotting, dullness, crocking, poor colour yields and even colour changes have been traced to the presence in the liquors of free metallic ions.

Generally speaking, acid dyes are sensitive to iron and copper. Chrome fast colours, applied after chroming, are sensitive to iron, nickel and lead. Sulphur colours are affected by copper, azoics are duller when dyed in iron vats, and some direct colours for rayons give false tones in the presence of copper. (Grundy, *J. Soc. Dyers and Colorists*, 45; 39; 51; 377.)

Application to Vat Dyes

Acetate colours dyed in a soap bath will show reduced colour yields and spotting if any alkali earth or metallic soaps are deposited on the fibres. This can be prevented by the introduction of ethylene bis-iminodiacetic acid into the bath. Work on vat dyes has shown that the use of an organic sequestrant does reduce crocking. It is now claimed by investigators that organic sequestering agents are suitable for use with all dyes, as it is known that a few colours, such as metallised dyes, *e.g.*, Neolans or Palatine fast dyes, are affected adversely by action of ethylene bis-iminodiacetic acid and salts.

In kier boiling the introduction of the organic sequestrant in the liquor keeps calcium soaps in solution, and this assists materially in producing a whiter and softer fibre. In the preparation of printing pastes with hard water, the use of this additive prevents livering at alkaline *p*H values, and starch finishes and sizes give cleaner and more brilliant results when ethylene bis-iminodiacetic acid or its salts are present.

The use of polyaminocarboxylic acid derivatives for preparing clean metal surfaces is now being appreciated by metal processing concerns with experience of polyphosphates. In the past, these inorganic sequestrants have been somewhat limited in their application due to their stability at high temperatures and high alkalinity. Ethylene bis-iminodiacetic acid and its derivatives will prevent precipitation of calcium phosphates, silicates and carbonates at high alkalinity and high temperatures.

This organic acid also possesses the property of stabilising metasilicate baths, and as little as 0.1 per cent of the sequestrant will prevent metasilicate being thrown out of heated solutions as a colloidal precipitate. In anodising it has been found that ethylene bis-iminodiacetic acid tends to counteract the effect of dissolved metal ions on the dye and enables more brilliant colours to be obtained.

As an alternative to cyanide in metal plating the use of ethylene bis-iminodiacetic acid has been claimed to produce excellent results. It is also worth noting that silver is readily reduced to the metallic form by this acid and deposited as a silver mirror.

By preventing the deposition of insoluble alkali earth and metallic soaps from solutions of fatty acid soaps, the use of the polyaminocarboxylic acid derivatives is of considerable importance in the production of liquid soaps, shampoos, industrial washing compounds, bath oils, bubble baths, lather-type shaving creams, skin cleaners, cuticle removers, etc. For all these applications the organic sequestrant is superior to the polyphosphates, which are unstable in aqueous solutions.

Agricultural Chemicals

Some of the newer agricultural chemicals, such as 2, 4 dichlorphenoxyacetic acid, form insoluble calcium salts on dilution with hard water, with a resultant depression of their biological activity. As 2, 4 D is generally sold as a 20-40 per cent aqueous solution of the amine salt, the addition of polyphosphate is unsatisfactory owing to its limited compatibility and the danger of its hydrolysis and inactivation on storage. The amine salts of ethylene bis-iminodiacetic acid are not only extremely stable and effective water softeners, but they will prevent precipitates of the 2, 4 D in hard water. Hard water solutions of cationic surface active agents show lowered germicidal activities than those made in soft water, and here again the presence of a small quantity of the organic sequestrant prevents precipitation in ordinary tap water. Ethylene bis-iminodiacetic acid is particularly valuable where emulsions have to be prepared with hard water.

In several types of synthesis, the presence of traces of alkali earth and metallic impurities is known to have a retarding effect on the yields, *e.g.*, production of hydrazine from ammonia hypochlorite gives decreased yields in the presence of calcium. It is suggested that where such difficulty is presented consideration might be given to using organic sequestrants.

A NEW LIQUID OXYGEN CONVERTER

Advantages for Industrial and Other Uses

A LIQUID oxygen converter having significant advantages for a variety of uses, including aviation, industrial and medical purposes, has recently been developed by W. A. Wildhack and associates of the U.S. National Bureau of Standards with the co-operation of the U.S. Bureau of Aeronautics, Department of the Navy. The converter is fully automatic, requiring no electric or other source of power. Its compactness and greatly reduced weight are claimed to represent a decided advance over gaseous equipment now used, for example, to supply breathing oxygen in aircraft. Other features include sturdiness,' simplicity of design and operation, rapid attainment of operating pressure, economy of oxygen, and delivery of warm gas.

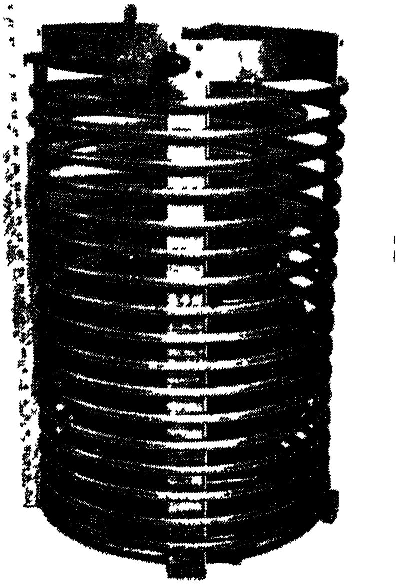
It consists of a standard 25-litre metal Dewar flask modified by the addition of a bottom drain, together with two coils, one for build-up of pressure and one for warming the gas as it is delivered. After it is filled with liquid oxygen, the flask may be sealed off from the atmosphere.

Building Up Pressure

When oxygen gas pressure is to be built up, a valve is opened, allowing liquid to flow through a drain tube and liquid trap at the bottom of the flask and into the build-up coil, where it is evaporated and warmed by the atmosphere. The warm gas rises through the coil by thermal convection until it enters the top of the flask, where it mixes with the gas above the liquid. Here some of the gas condenses on the liquid surface, but the condensed gas is immediately replaced by freshly warmed gas and the cycle continues, the gas pressure rising quickly.

Once pressure is established, gas may be withdrawn by forcing liquid through the bottom drain into the withdrawal coil, where it is evaporated and warmed by the atmosphere as it passes to the outlet mechanism. Excessive rise in pressure is prevented by the closing of an automatic bellows-type valve in the build-up coil, which stops the flow of additional gas to the top of the flask.

At higher pressures, another pressure-actuated valve, the "economiser," vents gas directly from the top of the converter to the delivery coil. When this circuit is open, any withdrawal of gas diminishes the pressure quickly to operating values.



The new liquid oxygen converter, which requires no source of power other than the heat of the atmosphere

Two pressure relief valves are also provided, one in the build-up tube and the other in the delivery line.

The fact that it is not necessary to heat the entire mass of liquid to raise the pressure is claimed to constitute an important difference between this and earlier types of liquid oxygen converters. The rapid decrease in density of the liquid with increasing temperature makes possible a relatively warm surface layer in the liquid, as very little heat is lost from this layer to the rest of the liquid by convection. Thus, the heat transferred to the gas as it passed through the build-up coil is largely retained in the space above the liquid in the container, and a rapid increase in pressure results.

The total converter unit is 25 in. high and 18 in. in diameter. It weighs 60 lb. and holds 62 lb. of oxygen, enough for 10 men for 10 hours. To supply this quantity of oxygen from gas cylinders at 1800 p.s.i. would require 21 tanks of 514 cu. in. each, which would weigh a total of 350 lb.

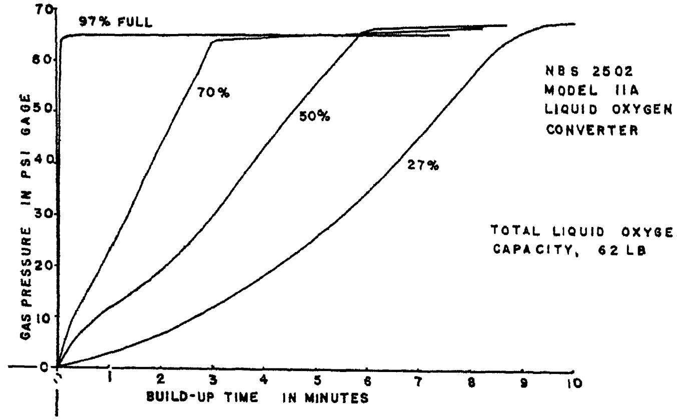
empty. For flows up to 150 litres per minute (5 cu. ft./min.), gas is delivered at a temperature differing by only about 5°C. from atmospheric temperature. Flow rates over 10 times as great may be obtained, but at these larger flows the delivered gas is colder.

Pressure may be built up, when the container is full, from zero to 65 lb. p.s.i. in 10 sec. The flask is somewhat stronger than the standard Dewar flask and will withstand internal pressures of 200 lb. p.s.i. Pressure, once achieved, is quite stable, and although it drops with vigorous shaking, recovery is almost instaneous. The depth of the liquid in the container is measured by a differential bellows-type manometer connected between the bottom drain and the top of the neck of the Dewar.

To permit the converter to operate in an inverted position, a gravity circuit is provided, consisting of a line from the top of the neck of the Dewar to the bottom of the delivery coil. It contains a gravity-controlled valve which opens only when the apparatus is inverted.

The converter is reported to have successfully withstood tests at the U.S. National Bureau of Standards and other U.S. Government laboratories under conditions of severe vibration (3000 cycles per min.), rapid acceleration (nine times the acceleration of gravity), severe cold (−40°C.), and severe heat (75°C.). Performance at tilts up to 45° was not materially different from that observed in the erect position.

When the apparatus was inverted, pressure rose somewhat rapidly because of the shorter heat path from the atmosphere to the liquid in the neck, but in five-minute runs the pressure rise was not generally sufficient to open the relief valve. Converters built on the National Bureau of Standards design by commercial manufacturers are said to have operated satisfactorily in flight tests carried out by the U.S. Air Force and the Navy at altitudes up to 40.000 feet.



Pressure development in the converter when filled to varying percentages of its capacity

AUSTRALIAN COAL-OIL

Wide Conversion of Brown Coal

As a result of recent researches by industrial chemists of the Australian Council for Scientific and Industrial Research, the extensive brown coal deposits in the State of Victoria may be used for the production of motor fuels, reports the Australian Government News and Information Bureau. Following recent technical developments, production cost is now approaching that of ordinary petroleum. Research has shown that local brown coal gives better results than German brown coal, to which the production process was largely applied during World War II.

Since Australia has, as yet, no considerable oil flow, the successful experiments hold much promise for the expansion of industry. The procedure now under study in Victoria embodies both the American and German practices, and involves the gasification of "fluidised" finely powdered coal with a mixture of steam and oxygen.

The Latrobe Valley in Victoria, under which are large brown coal deposits, is expected to become one of the largest industrial seams in Australia. More than 27,000 million tons of brown coal are believed to be available. Opencast mining in the area has operated for some years at Yallourn.

Another seam is to be started at Morwell, which is estimated to cover 40 square miles. Four great briquette factories will eventually turn out 650,000 tons of briquettes a year.

DUTCH CHEMICALS AND FIBRES

Improved Manufacturing Facilities

THE Rubber Foundation, of Delft, takes credit for a special method of making transparent hydrochloride rubber almost identical with Pliofilm, and N.V. Stork-Chemie has acquired from it a licence for the manufacture of the new product, called Rulahyd.

* * *

The Royal Dutch Salt Industry, Ltd., of Boekelo, reports that Germany has recently become a big competitor in the European markets for crude salt and that salt prices have shown continuous reductions. The company is proceeding with the implementation of its chemical projects.

* * *

The Chemische Fabriek, Ltd., of Naarden, which already controls five foreign subsidiary companies at Bombay, Buenos Aires, Brussels, Stockholm, and Batavia, has put up another at Oslo, Norway, under the style of " Norsk A/S Naarden." The aromatics industry in Holland appears to be well-booked with foreign orders.

* * *

The liner *Westerdam* has taken to New York the first instalment of quinodine sulphate under the American counterpart funds purchase contract. The shipment amounts to 50,000 ounces and is destined to be used as a heart tonic. Because there is a pressing need for this quinine development the Nederlandsche Kininefabriek, of Maarsden, hastened the processing from cinchona bark, so that the shipment could be made ready some two months ahead of the schedule.

* * *

The Royal Sulphuric Acid Company of Ketjen reports that its factory for manufacturing sulphur dioxide, erected in 1948, has been in continuous working up to now. The installation for the production of permanganate of potash is being enlarged and is expected to be completed within a very short time. While the capacity for producing sulphuric acid has been substantially enlarged since October 1947, the company was not able to export major quantities in 1948 owing to the keen demand for sulphuric acid in the home market. The comparatively new branch of production of dye intermediates and softeners for the plastic industry is proving a success.

The leading Dutch rayon producer, Algemene Kunstzijde Unie, of Arnhem, has developed a fully synthetic fibre which promises to meet all demands of the Dutch public for artificial yarns. Production of carboxymethyl cellulose plastic by this company is also progressing.

* * *

The National Bank for Reconstruction (Nederlandsche Maatschappij voor Financiering van het National Herstel) whose loans to Dutch chemical firms were referred to in THE CHEMICAL AGE, *60*, 744, has obtained a loan from the International Bank for Reconstruction. This is with a view to financing the expansion of the State mines of Limburg; the erection of a new factory at Beek; of the N.V. Mij. tot Exploitatie van Kooksovengassen; the N.V. Koninklijk Nederlandse Zout Industrie of Hengelo; the N.V. Fabriek voor Chemische Producten Vondelingenplaat of Vlaardingen; N.V. Franken-Donders United Aniline Works of Tilburg; N.V. Kempensche Zinkmij. (Zinc de la Campine) of Budel. Also, the loan in intended to help finance the putting up of a new factory for making streptomycin by the N.V. Centrale Suiker Mij., of Gorinchen.

The Dutch cement and glass industries are also among the recipients of financial advances.

Australian Wool Wax

ECONOMICAL methods of extracting and refining waxes from sheep's wool and from sugar cane are being investigated in Australia by the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organisation. Derivatives of these two waxes are also being examined for possible commercial use. Quantities of a potential value of many thousands of pounds have hitherto been lost every year. It is considered that between 10,000 and 15,000 tons of wool wax could be extracted from the greasy wool secured annually in Australia. Only a small proportion is now being used commercially. The CSIRO has installed a highly complicated vacuum still to separate the components of the wax.

OFFICE APPLIANCES IN CHEMICAL ORGANISATION

Some Modern Book-keeping and Accounting Machines

by S. HOWARD WITHEY, F.Comm.A.

IN every works and industrial organisation separate activities have to be recorded in one form or another. When business records are made almost wholly by pen-and-ink methods a great deal must depend upon the accuracy of the entries made in the various subsidiary books—the purchases journal, sales book, cash book, etc.—and it is the need for analysing the original entries and for keeping separate accounts that constitutes the drudgery and expense of clerical work.

Mechanical Aids

The same need to maintain a suitable system of internal check and control also prevails when modern office equipment is used, but mechanical aids enable the prime records to be verified at more frequent intervals and ensure that errors are located much quicker than is possible in the case of manual records.

During the past four years the attitude of executives towards labour-saving machinery in the office has changed, and in the chemical industries the majority of successful businesses have made the office the heart of the concern There mechanical aids are often regarded as essential as up-to date plant in the works.

It is now being widely recognised that the need for cutting out unproductive work calls for the employment of various forms of mechanical equipment to assist in the attainment of production targets and to cope with modern developments.

Adding and calculating machines perform much routine work of the kind which office workers most dislike and are of two main types. One provides a printed list of the items to be added; the other arrives at the total, the advantage of the former being that it enables the items to be checked back. Where a printed list of amounts is not required the operations can be performed more quickly by using a machine with a greater range and which is useful in determining the cost of each unit of production, and in computing percentages.

The original machines of the Underwood-Elliot-Fischer type were constructed to typewrite in bound books and many firms now use them for making out invoices in conjunction with a bound day book. The typing mechanism may be provided for typing only, for vertical adding and subtraction, or for vertical and horizontal adding and subtracting.

Models employing a flat writing surface are still very popular as they enable forms of awkward shape or size to be entered and removed. Such items as price tickets, cards, labels, and several forms of varying size, shape and thickness can be entered without bending, curling or creasing.

The use of continuous rolls of carbon eliminates the handling of loose carbons, and if it is necessary to fill in items at various points the writing head can be removed direct from point to point without returning and spacing. If copies are not required a number may be inserted at one operation and removed one at a time as complete.

Some Burroughs models are designed to perform a variety of work, and an all-round machine is extremely useful in an office where only one machine can be operated.

For particular classes of work in larger offices other models are more suitable; one type is equipped with a typewriter keyboard of standard pattern that enables a full description to be recorded; another type possesses special keys for abbreviations and rapid posting. One of the latest models posts, proves and journalises in one operation; writes the date, folio and amount at the same time; adds the debits, subtracts the credits and automatically extends the new balances and provides separate totals. Directly the postings have been completed the clerical accuracy is verified and proof obtained that all original items have been posted, that none has been posted more than once and that each amount has been posted to the proper side.

Daily Balancing

On accounting machines the ledgers can be posted and balanced each day, all the carriage movements, additions and subtractions are automatically controlled, debit or credit totals and balances can be produced and printed by depressing one key, and negative balances can be shown in red with a distinguishing symbol. Each posting gives the date in the appropriate column, and the rapid and correct alignment of ledger account, statement, journal, or audit sheet (and other related forms) is ensured by a special collating front-feed carriage.

Various models of the Ormig type are now used in order and billing routine, production control, and ledger posting, the basic idea being to make the original entry in the form of a master copy. This is done by placing a sheet of hectographic carbon (with the coating upwards) at the back of a sheet of ordinary art paper and then either typing or writing on this master from which all subsidiary copies and records can be produced, thereby eliminating all re writing and re-typing.

From a process layout master it is possible to obtain all order copies, piecework tickets, progress slips, material requisitions, identification tags, etc., and with the ledger-posting method the original entries are made on a master journal sheet from which they can be transferred mechanically to ledger cards, statements, statistical records, etc. When once the sheet has been checked, posting errors cannot creep in.

Machines marketed by suppliers of office equipment include electric carriage typewriters, statistical machines and cash registers, while billing and credit-posting machines are now being used more extensively.

Summary Sheets

The old type of subsidiary book is now giving way to forms and cards and summary sheets which can be inserted by the operator, so that the details can be carboned. While other bills and ledger cards are being printed the summary sheet can remain in the machine until full, when the totals can be produced at the foot under specific headings. In this way, numerous accounts can be made up at one operation and the total charges suitably summarised.

There are now low-priced portable book-keeping machines which occupy less space than a typewriter and bring within reach the manifold advantages of machine accounting, and also assist larger firms in the control of different works departments.

Most of the models can be operated without special training and the short-cut keyboard is extremely simple. It usually has automatic ciphers and dates and is adapted for the simultaneous depression of several keys. They are widely used in connection with such work as analysis of sales, purchases and expenses, the preparation of wages summaries, the compilation of the personal accounts of customers and suppliers and the posting of stores ledgers.

Business executives are now alive to the fact that the maintenance of the old type of record involves the making of numerous entries under a variety of different headings and, therefore, a considerable amount of unnecessary clerical work. In the matter of raw materials received, for example, as many as twenty distinct entries may be required under such headings as advice note, invoice, inwards number, weight, number or quantity, cost price, etc., and the recording commences directly an order for the supply of raw material is placed. When the advice note comes to hand the details have to be inserted in the appropriate column, including the date and advice number, and the material has to be recorded in its proper stock account.

Unit Cards

By entering all types of information on a unit card, which has been designed for use right through to the compilation of the final figures, all copying can be eliminated, and as there is no point at which mistakes can be made it is possible to avoid tedious checking. Figures which are correct at the start must be correct at all subsequent stages.

Documents of original entry—whether single or in duplicate or triplicate—can be employed in such a way that all related items are quickly classified under their proper headings, and with some systems a pair of tweezers and a needle for sorting is all the machinery required.

But, while any business document can be made into a unit card by the simple process of slotting, unit cards can now be obtained of almost any size, length or depth and can be punched with a series of holes, the number and position of which depend on the headings printed on the card.

Original records used with tabulating equipment often take the form of cards on which all information is reduced to a numerical basis, such as date, employee number, order number, process number, hours of elapsed time, rate of pay, and so on, and a sorting machine can be set to sort the cards on any desired basis. When this has been done the cards of a particular class can be run through a machine which will add them and produce the total amount for a given order number or a given worker.

Filing Systems

Present day office appliances include filing systems, adding and calculating machines, cash registers, book-keeping and accounting machines, and sorting, statistical and tabulating equipment. In addition, there are numerous devices for protecting cheques, for cheque writing, for sorting and counting coin, and a variety of loose-leaf ledgers, ledger cards, duplicators and time recorders. Instead of attempting to adapt any of these to a particular class of work it is always advisable first to decide upon the objective, otherwise the best results may not be obtained.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

TWO improved types of titanium oxide, the first of what is expected to be a series resulting from the introduction of new processing equipment, are now being manufactured and standardised in the U.S.A. by the American Cyanamid Co., Bound Brook, New Jersey. The first of these Unitane 0.310 (Anatase type), is claimed to be particularly suited for high temperature baking enamels, refrigerator finishes, lacquers and phenolic resin enamels. It is also recommended for use in architectural and industrial finishes where the extraordinarily high hiding of rutile is not required and where the clear bluish tone of Anatase is preferred for its decorative effect. Unitane 0.310 is characterised by low reactivity with most vehicles and produces finishes of excellent gloss and gloss retention. In lithographic inks, it has good resistance to fountain solutions and is useful in printing inks where the Anatase type of titanium dioxide may be preferred to the rutile type. The second of the new types, Unitane OR-342, is a variation of rutile titanium dioxide developed especially for use in enamel finishes and related products. It is said to be particularly adapted to formulæ including more reactive vehicles such as the Maelic modified types and certain highly bodied oleocresinous varnishes. Unitane OR-342, the company says, performs especially well in metal decorative roller coatings where very thin films are laid down and must have the maximum flow to give satisfactory coverage and uniformity. It is reported to be excellent for use in alkyd baking enamels where it maintains high gloss and good colour retention under ageing conditions. Samples of both these types may be had for testing purposes upon written request to the company.

* * *

An improved design in stainless steel open Dewar flasks has just been reported from the U.S.A. Elimination of all interior seams by helium-arc welding is said to provide greater strength and a smooth unobstructed surface, contributing to greater efficiency of these durable vacuum-insulated vessels. These new types are fabricated of 18-8, type 304, stainless steel. The internal wall surfaces are highly polished to a mirror finish for optimum reflection of heat rays. In addition, the flasks feature a newly patented radiation shield, which is also highly polished on both sides. Thus the four super-finished surfaces provide an effective barrier against heat penetration. With a high vacuum of 10^{-6} mm. for insulation, the effectiveness of the flasks in containing liquid air, liquid nitrogen or other extremely cold materials is claimed to be unequalled by any other metal container. A wide range of 26 standard sizes, up to 13 in. by 36 in. inside diameter is stated to be available by the manufacturers Hofman Laboratories, Inc., Newark, N.J.

* * *

Surinam, which already supplies the bulk of the bauxite requirements of the U.S.A. is to have further facilities to assist in transportation and shipment. A transfer station will shortly be completed at Carenage, a small fishing village, west of Port-of-Spain, Trinidad. Conveniently placed near Surinam's bauxite mines, which are located up shallow rivers on which boats cannot carry full loads, the $6 million station is expected to start operations within a few months. It will be equipped to unload 1200 tons of bauxite ore per hour and to load 2000 tons per hour. Figures from the Department of Commerce show that the United States obtained 904,711 long tons of bauxite from both domestic and foreign sources in the first quarter of 1949. Of this total, 460,636 tons came from Surinam, 115,001 tons from Indonesia, and 26,497 tons from British Guiana, while United States production was 302,577 tons.

* * *

Commenting on the use of natural rubber in the construction of roads and highways, Mr. Harvey S. Firestone, Jnr., said that such a development would be an asset to the dollar earnings not only of the British Commonwealth but also of Holland and France. "Consumption of natural rubber," he said, "can be expected to increase further with new uses, but it must be kept in mind that the use of rubber in roads depends upon reasonably low and stable prices. Our laboratory and highway tests, supplemented by extensive Far East and European experiments, indicate that the use of rubber powder in asphalt mixtures greatly improves the durability of black-top highways, and reduces maintenance costs. Such road have been laid in Ohio, Virginia, Minnesota and Texas and are being considered in other States."

Technical Publications

RESEARCH and laboratory work frequently necessitates the use of electrical recorders which can cope with quickly varying quantities providing high-speed temperature recording, or measurements of shock and strain. Such an instrument described in the latest catalogue sheet is the highly responsive Inkwell Grapher (No. 302/1906) of Everett, Edgcumbe & Co., Ltd., London. This company has also developed a special type of super-responsive grapher of the inkless type which measures the duration of a process or operation such as a spot or butt weld by marking on a paper tape the number of cycles of current taken during that particular process.

* * *

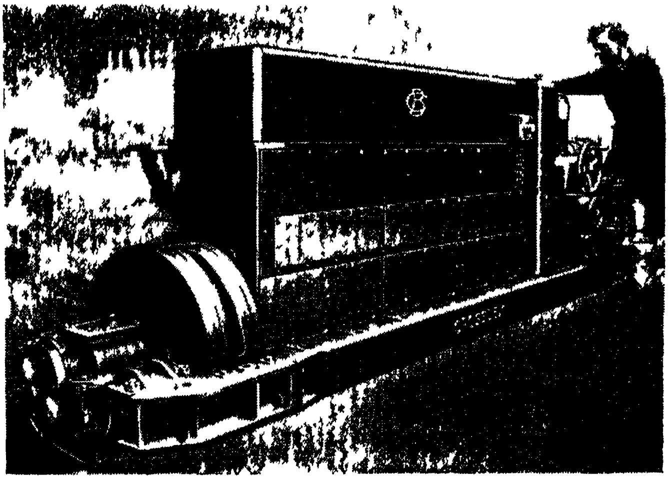
SUBSTANTIAL savings made possible by the use of steel castings in virtually every phase of basic manufacturing operations in the U.S.A. are emphasised in a new illustrated booklet just released by the Steel Founders' Society of America, Cleveland 15, Ohio. The 34-page booklet directs particular attention to the versatility, strength and dependability of steel castings. "The casting of steel," it states, "represents the most direct method of producing steel shapes to final form, while still retaining all the advantages of the basic material. By varying the alloy content of the steel, or the heat treatment of the casting, or both, a wider range of mechanical properties can be obtained in steel castings than in any other castable metal." It discloses that the U.S. commercial steel casting industry increased from 903,869 net tons in 1913 to 2,448,329 net tons in 1943.

* * *

ESTERS of glycerol and many glycols and polyglycols are treated technically in detail in a new brochure issued by the Glyco Products Co., Inc., Brooklyn, N.Y. The materials range from liquids of low freezing points to wax-like solids. Large-scale production has enabled prices to be reduced below pre-war levels.

* * *

WATER Pollution Abatement Manual for insoluble and undissolved substances, is the title of a second booklet on water pollution and its attendant problems just issued by the Manufacturing Chemists' Association, Inc, Washington, D.C. The manual (Sheet W-2), 12 pages, is divided into seven sections, including: Effect on receiving waters; permissible concentrations; removal of solids from waste; sludge digestion; sludge dewatering; sludge disposal; and equipment sources. The Association's first pamphlet on the subject (Manual Sheet W-1), dealt with Organisation and method for investigating wastes in relation to water pollution. Both manuals were prepared by the association's water pollution abatement committee. Additional manuals will be issued from time to time. Copies of the new manual may be had from the association.



Six-cylinder ERL type engine to be shown by Crossley Bros., Ltd., Manchester, at the forthcoming Engineering and Marine Exhibition, Olympia, London. Numbers of this type of engine, differing only in detail from the marine type, have been installed in the heavy chemicals and oil industries

The Chemist's Bookshelf

CHEMICALS, HUMUS AND THE SOIL. Donald P. Hopkins. London: Faber & Faber, Ltd. Pp. 278. 12s. 6d. net.

The author, a chemist, changed from agricultural research work to the agricultural industry proper, and as a result of his contact with farmers, he came to the conclusion that the scientific principles underlying the uses and functions of both manures and fertilisers were often misunderstood. The first part of the book presents the case for the use of fertilisers, and also deals with the general principles of maintenance of soil fertility. The chemical trio, for nitrogen, phosphorus and potassium dominates the ten chapters of Part I. One chapter entitled "Balance Sheets for the Soil," begins with this quotation from Sir Ernest Benn's "Confessions of a Capitalist." "Most estimates certainly most public estimates, contain little more than half the expense that will be incurred in connection with an undertaking, and no man can judge such estimates wisely unless he is able to see not only the beginning but the end of the account." This introduces a study of soil budgets for compost, with the farmer's economic ability to buy fertilisers, and with the production capacity of the fertiliser industry. The seven chapters of the second part examine the case against the use of chemicals. Appendices contain recommendations for various crops, the relation of lime and fertility, and an exhaustive bibliography. The book can be recommended to all who are interested in the fundamental questions of agriculture and also to non-specialist readers.

A CLASS BOOK OF PHYSICAL CHEMISTRY. Lowry and Sugden. Second edition. 1949. London: MacMillan & Co. Pp. 454. 8s. 6d.

The original edition of this work, published in 1929, was intended as a textbook for students reading for examinations of the standard of Higher School Certificate and General Degrees. The present volume does not depart from this scheme and the main modifications are the addition of sections on activity coefficients and colloidal electrolytes, while the nomenclature in the chapter on thermodynamics has been altered. In an elementary book of this nature no discussion is included of spectroscopy and atomic structure, nor of the determination of the structure of molecules by means of X-rays and similar methods, since these topics are considered more suitable for physical and inorganic textbooks. The material is clearly presented and this new edition will continue to serve as a useful introduction to physical chemistry.

Metalworking Manual

BRINGING to a close a seven-year, $300,000 project in which more than 250 production engineers representing leading plants in American industry have collaborated, the first comprehensive collection of technical knowledge of metalworking production has been gathered together in an indexed manual, printed and ready for use. The project was undertaken under the sponsorship of the American Society of Tool Engineers, Detroit. This American professional society, which now has more than 18,000 members, most of whom use such technical data in their everyday occupations as production engineers, invested more than $150,000 in preparation of the text, and a similar amount was spent by the McGraw-Hill Book Company, New York. Actual production costs exceeded $250,000. There are more than 2,000 illustrations in the handbook, which was edited by Frank W. Wilson. The following subjects are included among 2300 in the basic reference manual: (1) planning and control of industrial production; (2) materials and machinability; (3) casting and extruding operations; (4) metal cutting, grinding and finishing; (5) metal forming; (6) welding, glueing and mechanical joining of materials; (7) surface finishing and protective coatings, peening and balancing; (8) gauging, inspection and testing; (9) fixture, die and tool design, limited production and master tooling; (10) machine tool controls and feeding devices.

HOME

Pharmaceutical Conference

There are 22 papers listed to be read in the science sessions of the 86th meeting of the British Pharmaceutical Conference which will be opened at Blackpool on Monday, September 12.

P.O. Metals Economy

A saving of 1850 tons of lead and 1900 tons of copper per 100 miles is claimed by the Post Office by using the coaxial cable for telephone communications over long distances. The cable is capable of carrying 600 simultaneous conversations.

New Plastics Products

De La Rue Extrusions are now marketing new rigid plastic rods and tubes for uses such as electrical conduits, kicking boards and food process tubing. They have applications also in building, furniture manufacturing, electrical and mechanical engineering.

Coal Output

Following the August Bank Holiday break, the total coal production in Britain last week was 1,381,100 tons more than in the previous week and 150,900 tons above the corresponding period last year. Comparative figures are: Last week, 3,947,800 tons (3,700,300 deep-mined, 274,500 opencast); previous week, 2,566,700 tons (2,397,300 deep-mined, 169,400 opencast).

Melamine Resin Patents

An announcement by Aero Research, Ltd., Duxford, Cambridge, states that Resin 286, produced by this company, is manufactured in accordance with the American Cyanamid Company's British patents BP 623335 and 622905 by agreement with the American Cyanamid Company and Ciba, Ltd. Any firm buying Resin 286 has full rights to use it for making wet strength paper according to these patents.

Attempts to Cause Rain

An endeavour to break the recent drought on Tees-side was made last week when experiments to cause rain were carried out by the RAF in co-operation with Imperial Chemical Industries, Ltd., Billingham, and the Meteorological Office. Three flights were made when Drikold, a form of solid carbon dioxide prepared by I.C.I., was "seeded" into suitable cloud formations. Rain was observed on the first two occasions, but on the third attempt clouds became unsuitable by the time the aircraft was airborne.

July Exports Down

The provisional total figure for exports in July is £141.5 million, £1.7 million less than in June and £9.9 million less than in May. Imports amounted to £186.5 million (provisional figure), £15.2 million below the June record, and, except for February, the lowest this year.

Cement Exports Record

A record output of cement was achieved by the Associated Portland Cement Manufacturers in the first seven months of this year, 818,000 tons being sent abroad out of the 3.7 million tons produced up to the end of July. An intensified publicity campaign against nationalisation of the industry is being carried out by the group.

Textile Examinations

Candidates for this year's examinations for National Certificates in Textiles are more numerous than in any year since the scheme was inaugurated by the Textile Institute and Ministry of Education in 1935. Total entries were 298—94 higher, and 204 for ordinary, certificates—from 17 technical colleges and schools.

Packaging Developments on View

The 1st National Packaging Exhibition sponsored by the Institute of Packaging will be held in Manchester from October 5 to 15. The exhibition, which will be opened by Sir Robert Sinclair, president of the Federation of British Industries, will give a comprehensive picture of packaging materials and methods.

Bravery Recognised

A doctor, colliery under-manager, and four miners from Cambois Colliery, near Blyth, Northumberland, who risked their lives to resuce a miner following a fall of roof, have received the King's commendations for bravery. One, Isaac Squires, a coal miner, received the British Empire Medal.

Crop Fibres for Roads

A system which makes use of waste tropical crop fibres for roadmaking has been developed by the A.S.P. Chemical Company. The fibres, when treated and mixed with soil, are said to make a surface which is unaffected by water and capable of bearing heavy loads. The Road Research Laboratory of the DSIR has co-operated in the experiments, and the ersultant product, "Pectosal," is intended mainly for development areas overseas.

◆ PERSONAL ◆

MR. J. G. BALL, who has served the British Welding Research Association eight years and was largely responsible for the establishment of its metallurgical laboratories, has left to accept an appointment as a principal scientific officer of the Ministry of Supply, at the Atomic Energy Research Station, Harwell. MR. A. BARKER, who has been secretary of the association since 1946, is leaving at the end of this month to become assistant director of the Federation of Boot and Shoe Manufacturers. Newly recruited members of the technical liaison staff are MR. R. G. BURT and MR. C. C. BATES.

SIR CYRIL ENTWISTLE, M.C., whose election to the board of Coalite and Chemical Products, Ltd., is announced, has risen to eminence in three spheres of public life. After distinguished service in the first World War, he entered Parliament in 1918, and was called to the Bar in the following year, later to become a K.C. He is best known in political circles for his work as chairman of standing committees, and temporary chairman of the House. Coalite and Chemical Products will have the benefit of his experience as a director of seven companies, and chairman of another seven.

The following appointments are included in those which have been made in connection with the founding of the New South Wales University of Technology. *Chair of Chemical Engineering*: DR. J. P. BAXTER, who was appointed director of the General Chemicals Division of Imperial Chemical Industries, Ltd., in 1945. He has been connected with the development of many new chemical products, such as polyvinylchloride, Gammexane, and organic fluorine compounds and also a comprehensive programme of research into chemical engineering problems. The doctor was awarded the O.B.E. for his work on atomic energy with the American team at Oak Ridge during the war. *Chair of Applied Chemistry*: DR. A. E. ALEXANDER, at present assistant director of research, Department of Colloid Science, Cambridge. He was Tilden lecturer of the Chemical Society in 1947. The doctor has been adviser to a number of industrial undertakings in connection with paints, emulsions, soaps and detergents, and is author of several publications on colloids, surface chemistry and polymers. His recent work has been concerned with the effect of the surface activity of substances on their microbiological and drug action.

PROF. HERMANN STIEVE, who enjoys world distinction as an anatomist, has announced his decision to resign from the Humboldt University, in the Eastern zone of Germany, on October 1, unless he is permitted freedom in research. He has been forbidden to publish any of his findings.

The election of two new Fellows and 33 Associates has been announced by the Textile Institute. Elected to the Fellowship are MR. E. COTTERILL, of Braintree, Essex, textile consultant to Courtaulds, Ltd., and MR. E. R. KASWELL, of Waban, Massachusetts, U.S.A.

MR. T. M. HERBERT has been appointed director of research by the Railway Executive, British Railways. Mr. Herbert, who was educated at Marlborough and King's College, Cambridge, was appointed research manager of the LMS in 1932. He is a member of the councils of various metal research associations.

Obituary

THE death was announced last week of MR. W. H. FRENCH, secretary and director of T. & C. Clark & Co., Ltd., Wolverhampton, manufacturers of acid-resisting enamelled chemical plant.

DR. FRITZ J. HANSGIRG, well-known Austrian-born metallurgist, chemical engineer, and inventor of the Hansgirg carbothermic method of processing magnesium, has died in New York at the age of 58. At the time of his death Dr. Hansgirg was chief chemical engineer of the Electro Metal Corporation and the Bach Corporation, industrial chemists.

MR. JOHN STEWART MACARTHUR, who has died at Pollokshields, Glasgow, was for many years managing director of Blacklock & Macarthur, Ltd., paint manufacturers, Glasgow, Cardiff, and London, until the business was acquired by I.C.I., Ltd. He was 73.

◆ OVERSEAS ◆

Neutron Radiation Blamed

Eye cataracts are an occupational disease of atomic scientists, affirm the trustees of the University of Illinois, U.S.A. They decided that neutron radiation from the university's cyclotron caused cataracts over both eyes of Dr. Lloyd Smith, a former university scientist. He will receive compensation.

Uranium and Radioactive Ores

What is reported to be the richest deposit of uranium known in Australia is stated to have been discovered 86 miles from Marble Bar. Mr. W. D. Millar, the Queensland expert, who makes this claim, has applied to the Mines Department at Perth for permission to prospect for radioactive ores near Wodonga, where large deposits of tantalite have been mined.

I.G. Farben Unit for Sale

The first unit of the former I.G. Farben combine to be sold to private purchasers will be Kalle & Company, A.G., of Wiesbaden-Biebrich, according to an announcement made by the U.S. Military Government. Eventually, all 50 of the now-independent economic units which formerly comprised the I.G. Farben properties in the U.S. zone will be put up for sale.

African Tung Oil Plan

The Colonial Development Corporation is to take over the work commenced by the Nyasaland Government to clear and plant with tung an area of some 20,000 acres in the Vipya Highlands of the Northern Provinces. Three oil expressing plants will be set up and the scheme, when fully developed, is expected to yield 5000 tons of oil yearly. The whole area should be in production by 1960 and maximum yield should be reached in 1965.

New U.S. $12 million Steel Plant

Immediate construction of a new $12 million plant, capable of producing 400.000 tons of steel ingots annually, has been authorised by the board of directors of the Armco Steel Corporation, Mr. Charles R. Hook, the chairman, announced. The plant, which will be built to the south of the corporation's main works at Middletown, Ohio, will include three 225-ton open-hearth furnaces of the latest design, and it is expected to give employment to over 500.

Argentine Iron Ore

A technical commission has begun exploration of the Argentine iron-ore deposits near Sierra Grande in the territory of Rio Negro. The deposits are stated to be both extensive and rich, and are very conveniently situated, only some 35 kilometres from the coast, between Antonio Oeste and Puerto Madryn.

Norway's Magnesium Plant

Construction is about to begin on a magnesium oxide plant at Norway's Heroya Kjemiske Fabriek. Construction will occupy 18 months to two years. The factory will produce oxide for use in fire brick and insulation material. Later, following completion of the project's seconding building period, the oxide will be processed into magnesium metal.

Turkish International Fair

At the Izmir (Turkey) International Fair, to be held from August 20 to September 20, inclusive, there is to be a British pavilion organised by the British Chamber of Commerce of Turkey, Inc., from whom full information can be obtained on application to P.O. Box 1190, Istanbul. On the stands of some 40 distributors and agents the products of more than 100 leading British manufacturers will be displayed.

American Engineers in Canada

The American Institute of Chemical Engineers will hold a regional conference in Montreal during September 6-9. This will be the first meeting of the organisation held in Canada since 1937. The programme has been designed to be of the widest interest to engineers in the chemical and process industries and will pay particular attention to the utilisation of Canadian natural resources and the aluminium industry.

Rising Request for Felspar

The Saint-Paul-de-Fenouillet region, France's largest producer of felspar, is reflecting heightened activity as a result of the increased use of its mineral output as basic raw material for various industries. In 1948 production was over 30,000 tons. St. Paul-de-Fenouillet can treat monthly 1000 to 1200 tons, producing material almost entirely free from iron and with low alkali content. The visible seams are estimated to contain about 1 million tons.

U.S. COAL WEALTH

More Than Half World Resources

U.S. BUREAU of Mines statistics indicate that coal and lignite comprise 98.8 per cent of the country's mineral fuel energy reserves, excluding atomic-power elements. Petroleum constitutes .2 per cent, natural gas, .2 per cent, and oil shale, .8 per cent.

Sub-bituminous and lignite deposits exist in enormous quantities in the Dakotas-Montana-Wyoming region, and it is toward these that the oil companies are taking a contemplative look, states an article by Mr. Julian E. Tobey, chairman of the technical advisory board of (U.S.) Bituminous Coal Research, Inc., in *The Rotarian* (Chicago).

Bituminous coal is widely distributed geographically. The Appalachian district is one of the world's great coal-bearing regions. Illinois, Indiana, and western Kentucky are also great fields.

World Reserves

A fairly accurate estimate of the world's known coal reserves is something like 7.5 million metric tons. The American hemisphere has more than half the world's known coal reserves. Europe has about 11 per cent, Asia over 29 per cent, and the remainder is deposited over Africa and Oceania. China also is believed to have a great coal potential.

Should underground combustion not prove feasible, all the more importance attaches to the mechanised efficiency of bituminous mining, states Mr. Tobey. This supports the highest wage structure of any major industry on which the U.S. Bureau of Labour Statistics collects earnings data, with thousands of coal miners earning $400, $500, and some even $600 a month. The industry productivity per man-day has been stated to be five times that of the British coal miner in underground operation.

In 1947 the U.S.A. achieved a record bituminous output of 620 million net tons, or 43 per cent of the world total, while exporting overseas a record total of 48 million tons of solid fuel (including anthracite, coke), largely to Europe. Its productive capacity is about 700 million tons a year, so that when synthetic liquid fuels become commercial, the bituminous industry must take on a great new potential demand. It is known that lower ranks and grades of coal are satisfactory for the making of synthetic motor fuel.

U.S. LIQUID FUELS

Large Additional Coal Needs

AFTER the U.S. Government's programme of converting coal into liquid fuels gets under way, additional coal needs will range from 190 million to 210 million tons per year, according to the American trade journal, *Coal Age*. The magazine says that up to 65 per cent of the raw coal needed to make one million barrels of oil daily will come from untapped coal lands lying west of the Mississippi River, and the remainder from the East.

" Assuming a total need of 575,000 tons per day," says the magazine, " this would mean about 200,000 tons from the East and 375,000 tons from the west. With increased efficiency and more operating days per year, eastern producers could probably mine the required tonnage without adding much to man power and without opening new mines. In the west, however, more miners would be needed and new mines would have to be opened. Overall man power needs for a full-scale coal-to-oil industry are estimated at 160,000 workers, 50,000 of whom would be coal miners."

The location of coal-to-oil plants will depend largely upon the availability of coal. A 20-year plant life, about the shortest that can be considered, would call for a daily mining capacity of 6000 tons of bituminous, 7300 tons of sub-butiminius, or 9200 tons of lignite to make 10.000 barrels per day. Other factors affecting the location of plants will include a good water supply, nearby markets, good transportation, adequate labour supply, and the existence of ready-built facilities, such as mines, housing, chemical plants, pipelines and coke plants, states *Coal Age*.

New Phosphate Fertiliser

COMMERCIAL production is in progress in the U.S.A. of fused phosphate fertiliser, a calcium magnesium phosphate from olivine-phosphate rock fusion, especially suitable for use on magnesium-deficient soils. Full-scale operations started in the Seattle Plant of Manganese Products, Inc., in 1948, when the initial capacity was about 50 tons of fused phosphate fertiliser in 24 hours. Plans have now been made to expand production to about 150,000 tons annually through the installation of a second and larger furnace.

An important characteristic of the new fertiliser is that it does not rot bags of any type.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CHROMOCINE, LTD., (formerly CHEMICAL DEVELOPMENT CO., LTD.), (M., 20/8/49.) London, W., chemical manufacturers. July 12, £2000 mortgage, to S. E. J. Brice, Staines; charged on 156 to 168 (even) Kensal Road, Paddington. *£4000. December 4, 1947.

EAST RIDING CHEMICAL CO., LTD., Hull. (M., 20/8/49.) July 15, £2500 (not ex.) charge, to Lloyds Bank, Ltd.; charged on land with factory, etc., thereon at Ryde Avenue, Hull. *Nil. February 14, 1949.

PH-ENTEX PRODUCTS, LTD. (M., 20/8/49). Slough, manufacturers of detergents, etc. July 7, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on factory 518 Ipswich Road and factory corner of Montrose Avenue and Edinburgh Avenue, both Trading Estate, Slough, with machinery, fixtures, etc., and a general charge. *Nil. July 31. 1948.

Satisfaction

BRITISH CELANESE, LTD. (M.S., 20/8/49.) London, W. Satisfaction July 19, of debenture stock registered September 24, 1946, to the extent of £10,350.

Company News

Edgar Allen & Co., Ltd.

The chairman reported a strong financial position, with total assets at £1,943,225. Profits, before depreciation, were £483,600 for the year, as a result of a turnover 11 per cent higher than in the previous year. A cash bonus of 5 per cent is to be added this year to the customary dividend of 12½ per cent.

Beecham Group, Ltd.

Profit for year ending March 31, 1949, £1,816,843, as compared with £2,370,181 the previous year. The directors recommend that £425,082 be carried forward. Owing to disappearance of the sellers' market, burden of taxation (11s. 1d. out of every £1 earned), and continuing rise in costs, no payment of final dividend on deferred shares recommended.

Beecham Maclean Holdings, Ltd.

Net profits, 11th annual report for year ended March 31, 1949, £284,322 (£182,764). Dividend on 4 per cent redeemable preference £34,028 (£34,295). Ordinary £231,000 (£129,250). Export and overseas sales increased by over 27 per cent.

George Cohen Sons & Co., Ltd.

Net profit, after taxation, including dividends from subsidiary companies, is announced as amounting to £209,771, for the year ended March 31, 1949. This compares with the previous year's net profit of £333,917. The distribution is recommended of a final dividend of 12 per cent, less tax, on the £600,000 of ordinary stock, making 20 per cent for the year.

Eno Proprietaries, Ltd.

Fifteenth annual report for year ending March 31, 1949. Net profits £302,203 (£282,881). Dividend on 5½ per cent preference £30,250 (same); on 5 per cent "A" preference £21,256 (£5314); on ordinary £245,668 (£188,939).

Macleans, Ltd.

Net profits shown in 14th annual report for year ending March 31, 1949, were £214,161 compared with £144,165 the previous year. Profits from home trade showed an increase of £19,000. Dividend on 4 per cent redeemable preference £14,124 (£14,262), on ordinary £165,000 (£99,000).

Marchon Products, Ltd.

Additional finance to the extent of £250,000 has been acquired by Marchon Products, Ltd., by arrangement with the Industrial and Commercial Finance Corporation. Directors and shareholders have subscribed a further £50,000. The transactions are to be covered by a debenture trust deed of £300,000. Nominal capital will be increased to £100,000 and bonus shares issued privately to the extent of £98,000.

Prichard & Constance (Manufacturing), Ltd.

Net profits for year ending March 31, 1949, £39.826 (£8466). Dividend on 8 per cent preferred ordinary £4400 (same); deferred ordinary (1s. 3d. per share) £34,375 (£2750).

The Stock and Chemical Markets

THE sharp rally in British Funds, which on Monday caused a rebound of up to 45s. in prices of long-dated stocks, helped sentiment in markets, and although business generally was on a limited scale. leading industrial shares improved with gains of up to 1s.

Once again, shares of chemical and kindred companies have taken their cue from the prevailing trend of markets. Imperial Chemical, which fell back to close on 41s. have rallied to 42s. At the time of writing, Turner & Newall recovered to 74s. 4½d., Dunlop's to 61s. and Courtaulds to 33s. 9d. Elsewhere, Fisons were 44s. after 43s. 6d., Laporte 5s. units again changed hands around 21s., Albright & Wilson were around 28s., with Brotherton 10s. shares at 20s., Amber Chemical 2s. shares 4s. 4½d., while Bowmans Chemicals were 7s.

In other directions, Boake Roberts were 29s. and Monsanto at 49s. 4½d. regained part of an earlier small decline. Glaxo Laboratories have strengthened to £18½, and elsewhere, British Aluminium at 43s. 3d. responded slightly to the higher price of aluminium. Lever and Lever N.V. were both firmer at 42s. 6d. and 44s. 3d. respectively.

Firmness was also shown by British Glues at 18s. 6d., although the company's participating preference shares at 35s. were again lower on balance. Triplex Glas, however, at 19s. 9d. turned easier, awaiting the financial results, but Ilford at 22s. 6d. strengthened again and British Oxygen at 93s. were firmer. Associated Cement recovered to 73s. 3d., British Plaster Board to 20s. 9d., while among paint shares, International Paint were 14s. 6d. "ex" the share bonus, although Pinchin Johnson receded to 34s. 6d. following market reports that a big new issue may be contemplated.

Goodlass Wall recovered to 29s. 9d. Borax Consolidated at 50s. 9d. were more active among shares of companies with important interests in the United States. Coalite & Chemical 2s. shares firmed up to 2s. 4½d. and Beechams deferred improved to 12s. 6d. following the chairman's annual statement which emphasised the diversified and widespread nature of the company's business. United Molasses were better at 38s.

Iron and steels remained steady with Dorman Long at 28s. 6d. and Stewarts & Lloyds 52s. 10½d., but United Steel eased to 25s. 10½d.

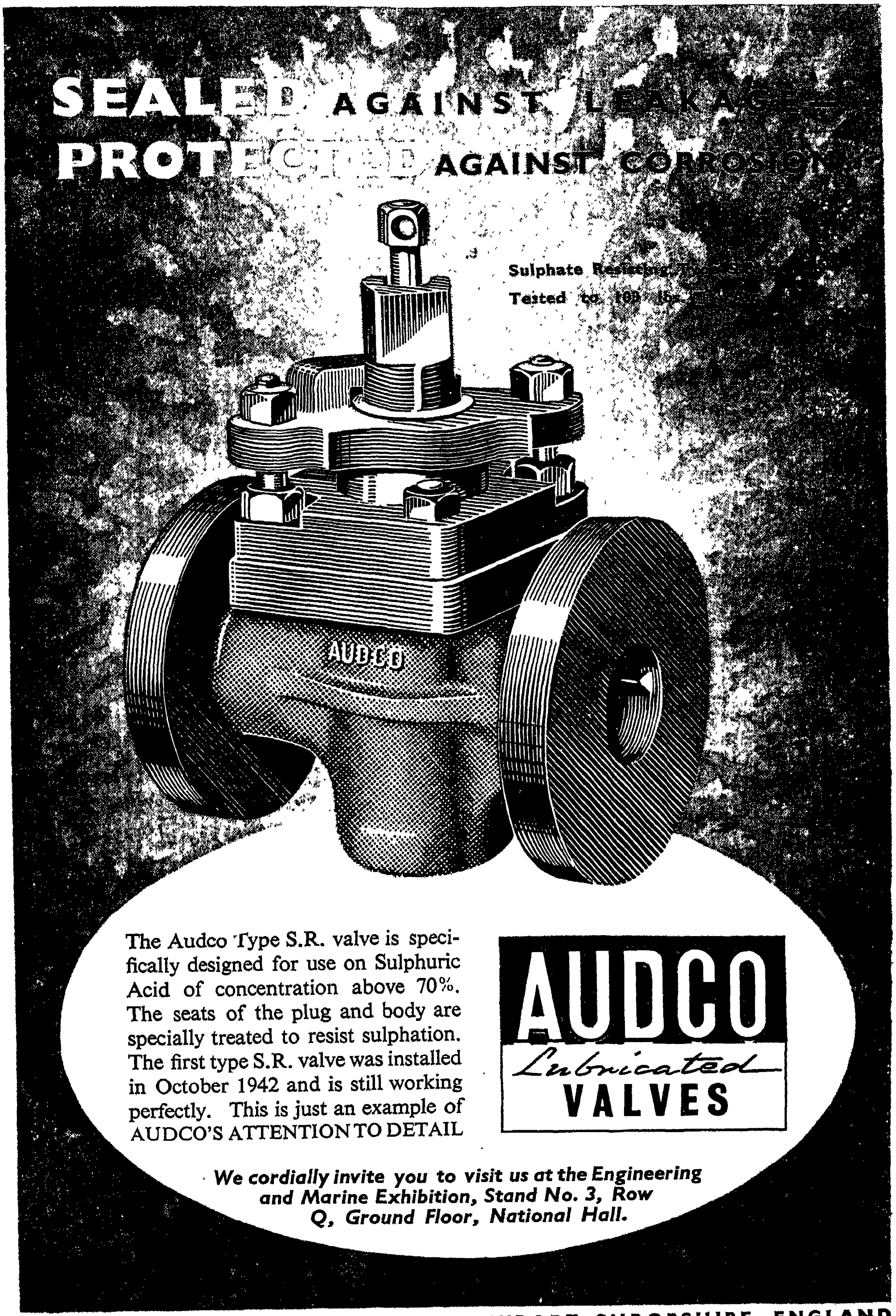
Boots Drug were firmer at 48s. 6d., with Sangers 28s. 3d., but in other directions, General Refractories eased to 22s. 6d. Oil shares failed to hold earlier gains, the reference in the Canadian Eagle report to the effect of lower oil prices on the current year's earnings affecting sentiment. Canadian Eagle shares receded to 28s., Trinidad Leaseholds to 23s. 9d., while Shell at 68s. 1½d. also lost part of earlier gains. Anglo-Iranian at 7⅜ were lower earlier in the week following the developments in Syria.

Market Reports

UNCHANGED conditions characterise most sections of the industrial chemicals market and, with two exceptions, no major price alterations have been reported. The price of dry white lead has been increased by £2 per ton and is now quoted at £115 10s. per ton. The new price for red lead is £105 10s. per ton. Borax Consolidated, Ltd., have advised a reduction in their prices for granular commercial borax and anhydrous borax. The former is now £27 per ton and the latter £46 per ton for 1-ton lots and upwards in bags delivered. The coal tar products market continues quiet with no special feature to record.

MANCHESTER.—With rather fewer industrial establishments closed down for the annual holidays seasonal influences have continued to be less in evidence on the Manchester chemical market during the past week. A fair amount of new inquiry has been reported for soda ash and other alkali products and actual bookings have affected a rather wide range of other industrial chemicals. Price changes on balance for the week have been relatively few in number. Buying interest in the fertiliser materials has been less quiet and a fair amount of forward business in a number of sections has been reported. Most of the tar products have continued on the slow side.

GLASGOW.—Conditions have gradually been returning to normal in the Scottish chemical market after the holidays. The turnover during the past week has been back to the level of early July. However, there have been no particular demands, and in general supplies are readily available. The only notable exception is potassium nitrate where the delivery is still about three months.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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each Higher priced photostat copies are generally available.

Complete Specifications Accepted

Hydrofining of hydrocarbon oils.—Anglo-Iranian Oil Co., Ltd., F. W. B. Porter, and J. W. Hyde. Oct. 10, 1946. 624,447.

Methods of coating surfaces with boron.—G. R. Martin. Jan. 15, 1946. 624,523.

Process for dyeing fibrous materials which possess no affinity for dyestuffs.—Ciba, Ltd. Nov. 2, 1945. 624,453.

Manufacture of a condensation product of sulphathiazole.—Ciba, Ltd. Nov. 29, 1945. 624,380.

Process for the manufacture of thioglycolic acid or its salts.—G. Carpeni, and P. Souchay. Jan. 24, 1946. 624,568.

Viscosimeters and plant incorporating such apparatus.—F. L. Smidth & Co., A/S. Dec. 30, 1941. 624,468.

2.8 - Dihydroxynaphthalene-6-sulphonic acid as the azo coupling component for diazotype prints.—General Aniline & Film Corporation. March 20, 1946. 624,472.

Process for the manufacture of piperidophenanthrene derivatives and salts thereof.—J. G. Fife. (Hoffman-La Roche & Co., A.G., F.). Feb. 20, 1947. 624,391.

Treatment of molten meals and molten alloys.—Foundry Services, Ltd., and K. Strauss. March 6, 1947. 624,479.

Electrolytic cells.—I.C.I., Ltd. March 11, 1946. 624,482.

Compositions comprising vinyl chloride polymers or interpolymers.—I.C.I., Ltd., K. W. Small, and P. A. Small. March 28, 1947. 624,393.

Process for the manufacture of folic acid.—Roche Products, Ltd. (Hoffman-La Roche & Co., A.G., F.). April 23, 1947. 624,394.

Method of desulphurising metals.—Soc. Anon. des Hauts-Fourneaux de la Chiers. Feb. 7, 1947. 624,539.

Production of thermoplastic elastomers of polyvinyl chloride.—Boothby & Thompson, Ltd., S. Szekely, and C. A. Redfarn. June 17, 1947. 624,225.

Dyestuffs.—I.C.I., Ltd., W. F. Beech, and M. Mendoza. June 20, 1947. 624,247.

Method of and means for automatically sealing fuel tanks and like liquid containers against leakage due to puncture.—R. Pickles, and J. Pickles. June 26, 1947. 624,283.

Spraying device.—Pest Control, Ltd., A. K. Dorman, and R. C. Clarke. June 30, 1947. 624,300.

Process for the manufacture of organo-silicon compounds.—Dow Corning Corporation, and J. T. Goodwin, jun. July 1, 1947. 624,550, 624,551.

Alloy steels.—B. D. Saklatwalla. March 17, 1944. 625,964.

Quantitative analysis of gaseous mixtures.—I.C.I., Ltd., and W. J. Clark. Oct. 11, 1944. 625,886.

Conversion of cyanamide or dicyandiamide to other compounds.—American Cyanamid Co. April 29, 1943. 625,890.

Process of oxidising primary or secondary alcoholic hydroxyl groups and aldehyde groups.—L. V. Farkas, and O. Schachter. Oct. 1, 1944. 626,048.

Manufacture of porous rubber products.—I. A. Ionides. (T. A. Te Grotenhuis). Dec. 6, 1945. 626,050.

Basic alkyl esters and method of preparing the same.—Sterling Drug, Inc. Feb. 2, 1945. 625,811.

Interpolymers of α-halocrylic compounds and polychloro-styrene.—General Aniline & Film Corporation. May 24, 1945. 626,054.

Method for the purifying by electrostatic precipitation of halogens, more particularly of chlorine, when produced by electrolytical processes.—Krebs & Co. Kommanditges. Jan. 7, 1946. 626,059.

Process of preparing amino substituted 2-alkyloxy-or 2-aryloxy-5-aminopyridine. Pyridium Corporation. June 29 1945. 626,062.

Manufacture of polyhydroxy compounds.—E. I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. Aug. 14, 1946. 625,909.

Process for the catalytic synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Aug. 23, 1946. 626,069.

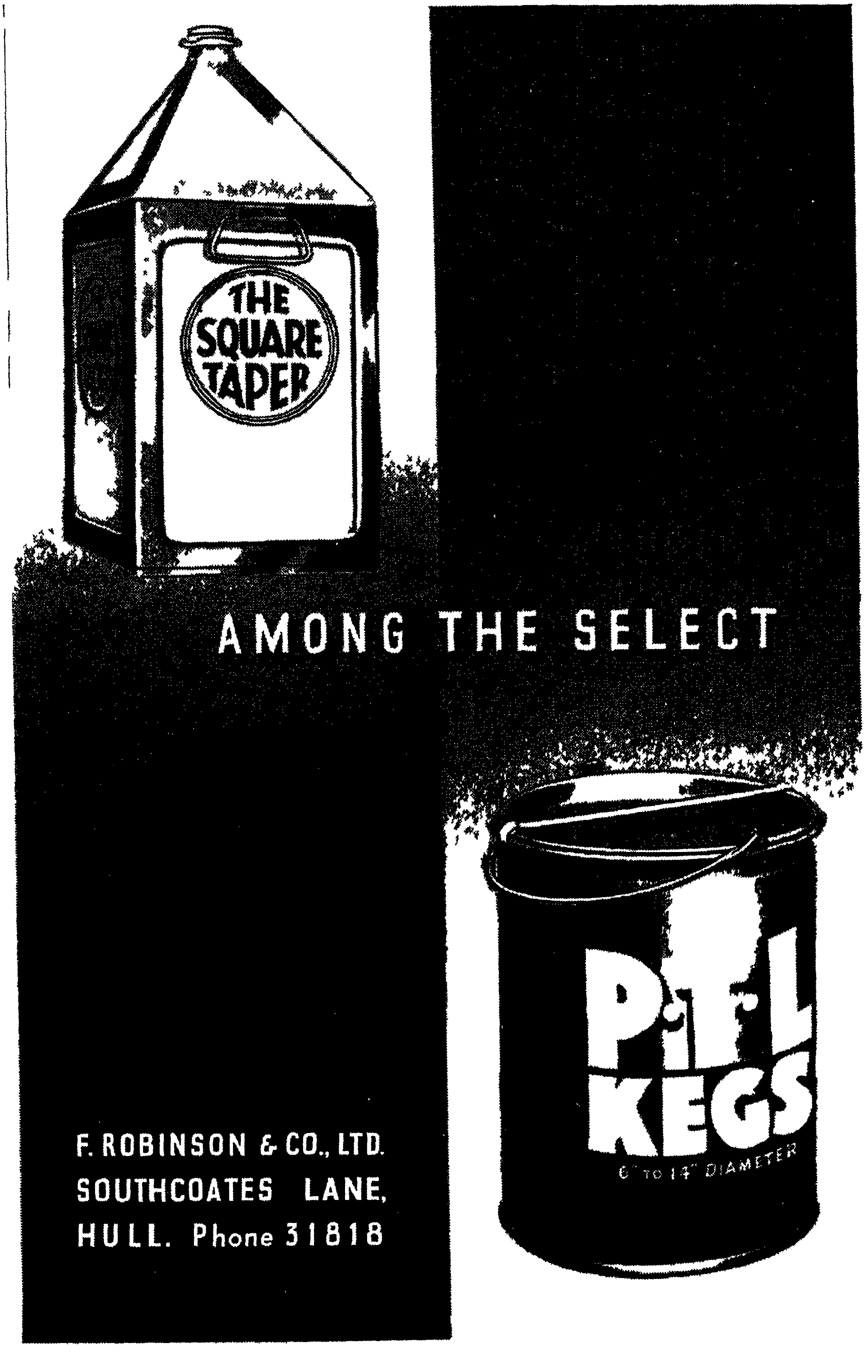
Method of temperature control in chemical reactions employing powdered catalytic material.—J. C. Arnold. (Standard Oil Development Co.). Aug. 23, 1946. 626,070.

Catalyst and process for synthesising organic compounds.—Universal Oil Products Co. May 31, 1939. 626,071.

Manufacture of organic nitrogen compounds.—Ciba, Ltd. Oct. 26, 1945. 625.840.

Process for the catalytic manufacture of hydrocarbons and oxygenated hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Oct. 2, 1946. 625,841.

Derivatives of 2-amino pyrimidine and its nuclear substitution products and processes for producing the same.—Pyridium Corporation. April 8, 1946. 625,931.



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Anode protection in electrolytic cells for the production of aluminium.—Det Norske A/S for Elektrokemisk Industri. Feb. 23, 1942. 625,861.

Manufacture of granular phosphatic fertilisers.—Sturtevant Engineering Co., Ltd., H. Richardson & Co. (York), Ltd., J. T. Proctor, and A. Ogilvie. Jan. 7, 1947. 625,863.

Synthetic resins.—Westinghouse Electric International Co. March 27, 1946. 626,145.

Resin bonded cellulosic fibrous materials particularly cords.—Wingfoot Corporation. July 31, 1946. 625,937.

Making of rubber-carbon black mixtures. —C. M. Blow. Feb. 4, 1947. 625,872.

Manufacture of phenols—Distillers Co., Ltd., B. V. Aller, R. H. Hall, D. C. Quin, and K. H. W. Turck. Feb. 13, 1947. 626,095.

Paradichlorobenzene.—Koppers Co., Inc. July 24, 1946. 625,940.

Method for producing spherical metallic granules.—Soc. Miniere et Metallurgique de Penarroya, and A. Falque. March 12, 1946. 625,941.

Polymerisable materials and polymers thereof.—I.C.I., Ltd., and R. Hammond. Feb. 19, 1947. 625,877.

Production of cellular polyethylene.—Expanded Rubber Co., Ltd., A. K. Unsworth, A. G. Goodchild, and A. Cooper. Feb. 27, 1947. 626,151.

Synthesis of α-acylamido-β, β-dimethylacrylic acids and esters thereof.—Merck & Co., Inc. March 22, 1946. 625,949.

Polymerisation of compounds containing the ethylenic double bond.—E. I. Du Pont de Nemours & Co. March 16, 1946. 626,155.

Nitrocellulose preparations. — I.C.I., Ltd., and J. Taylor. April 18, 1947. 625,996.

Process for the manufacture of 2-methyl-3-aralkoxy-4: 5-disubstituted-pyridine derivatives and vitamin B_6 derived therefrom.—Roche Products, Ltd., A. Cohen, and E. G. Hughes. April 18, 1947. 625,997.

Process for the manufacture of 2-amino-6-hydroxy-8-pteridyl aldehyde.—Roche Products, Ltd. April 23, 1947. 626,171.

Polymerised chloroprene-cashew nut shell liquid composition.—Harvel Corporation. May 26, 1939. 626,032.

Treatment of nitrogen-containing condensation polymers.—J. W. Fisher, H. Bates, and E. W. Wheatley. Oct. 12, 1945. 626,525.

Compositions of nitrogen-containing linear condensation polymers and the production of shaped articles therefrom.—J. W. Fisher, E. W. Wheatley, and G. W. I. Sheavyn. Oct. 12, 1945. 626,526.

Production of polymeric materials.—J. W. Fisher, and E. W. Wheatley. Feb. 7, 1946. 626,527.

Process for the treatment of sulphuric acid extracts of olefinic hydrocarbons.—C. Arnold. May 22, 1946. 626,466.

Method for the preparation of 4-hydroxy quinoline.—C. C. Price, and R. H. Reitsema. June 4, 1945. 626,472.

Methods of making substituted dihydroimidazolium compounds. — Monsanto Chemical Co. July 14, 1945. 626,473.

Methods of making dihydroimidazolium compounds.—Monsanto Chemical Co. July 14, 1945. 626,474.

Methods of preparing substitute imodazolium compounds.—Monsanto Chemical Co. July 14, 1945. 626,475.

Manufacture of derivatives of ethyl naphthalene.—Koppers Co., Inc. July 13, 1945. 626,313.

Methods of making substituted dihydroimidzaolium compounds. — Monsanto Chemical Co. July 14, 1945. 626,314.

Synthetic oils and resins and methods of producing same.—Solar Manufacturing Corporation. Aug. 17, 1945. 626,317.

2-Mercapto-4-keto-5, 6-dihydro-1, 3-thiazine and method of preparing same.—B. F. Goodrich Co. Oct. 5, 1945. 626,486.

Production of acid calcium phosphates and of calcium nitrate from raw phosphate and nitric acid.—Directie Van De Staatsmijnen in Limburg. Sept. 5, 1942. 626,491.

Production of dextroratory α, γ-dihydroxy-β, β-dimethyl butyric acid.—Merck & Co., Inc. Oct. 23, 1945. 626,498.

Process for preparing light magnesium hydroxide.—D. V. N. Hardy, D. G. Grant, and A. J. V. Underwood. Nov. 23, 1946. 626,503.

Methods for preparing organo-silicon halides.—British Thomson-Houston Co., Ltd. Dec. 8, 1945. 626,353.

Partial depolymerisation of highly polymerised polymethyl methacrylate.—Dohm, Ltd., and C. A. Redfarn. Jan. 1, 1947. 626,505.

Colour of aqueous solutions of saturated acid sulphuric acid esters or of saturated sulphonic acids or the salts thereof.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 20, 1946. 626,377.

Photographic diazotype compositions containing N-acylamino phenol couplers.—General Aniline & Film Corporation. May 8, 1946. 626,391.

Process for the manufacture of pentaenes.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). April 3, 1947. 626,392.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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The Spanish Experiment

THE problem which preoccupies industries around the world more or less intimately, according to their geographical situation and consequent political colouring, is their relationship with the State, whose tendency to exercise greater control is familiar in all countries.

Various gigantic experiments have been tried or are in progress, and a constant factor in world history during the past few decades has been the philosophy underlying these attempts to transfer ultimate authority in industry into new hands. It is frequently objected that economics and the like cannot be true sciences, because they lack the essential attributes of measurement and prediction, and unsuccessful experimentation may result in disastrous consequences. Yet experiment of a sort, whether scientific or not, is being tried on a large scale; and the chemist today, intimately associated with modern industries, has more reason than most to be keenly interested in its form and progress.

The common factor in all these experiments is that they are dictatorships in one form or another, and differ only in degree. Whether the syndicate system in Spanish industry is a worse or better, a weaker or stronger manifestation of dictatorship, is difficult to say. So much has already been published concerning its peculiar political and economic features that there is little need to add to it. It appears, however, that its leading exponents find it necessary from time to time publicly to reaffirm their faith and even present to the world some sort of apologetic.

Whether this is or is not influenced by secret misgivings, the fact remains that an important statement of faith and works was recently made at a meeting (July 13) of the Spanish Syndical Economic Council. The main work of this meeting (Pleno) was to consider progress made, more especially in regard to fertilisers, cement, and seed wheat, of which further details are being published (*ION*, July 1949, pp. 397-398). Señor Arias Salgado, the Minister and Secretary-General of the movement, introducing these reports, emphasised the national and international difficulties which confront any undertakings of this kind and, rather expectedly, affirmed his faith in the great possibilties opened up by vigorous and far-sighted planning: "By virtue of our spiritual and political advance, the health and well-being of the Spanish people has been, these last ten years, and is to-day, surprising; especially if one compares it

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

with the position prior to 1936." It will probably be remarked that, while the spiritial basis of this result is open to doubt, the scope for improvement in a country socially and economically as backward as Spain was makes spectacular betterment easily credible.

In his speech, the Secretary General said that the Economic Council followed the right path of responsibility and competence laid down by the syndical organisation, involving also a scrupulous "technical awareness." The meaning of the last is a little obscure, but apparently these qualities are to ensure that the Syndicates are fitted to control Spanish industry. In any event, it is not possible to go back to that regime of liberty as it was known before 1914, and was characterised by strikes, lockouts, uncontrolled production, and finally the crisis.

The Secretary-General insisted that increased production should be the principal aim of all concerned (the danger of overproduction is clearly not likely to be an urgent problem in Spain at present), but he, too, confirmed the existence there of the trouble common to many other economies. Some workers did not render their proper quota, and some employers were much more interested to maintain a certain price level, and to limit production. Spain evidently has come to recognise that there cannot be unbridled liberty, nor, on the other hand, too much control. In an endeavour to strike the happy mean the Spanish syndicates have been organised on the principles already well known. On the whole the speaker thought they have done good work, but they have undoubtedly been subjected to sharp criticism in Spain itself.

In this connection it is of interest to recall that, during the course of several months of last year, the editorial columns of *ION* were open to "The Industrialists." Questionnaires were issued to leading representatives of various industries seeking information on the reasons why particular industries were not in the flourishing position they could have been. There was some plain speaking in many of the replies which emphasised in particular the difficulties created by a wrong tariff policy and other alleged mismanagement at the higher levels. To what extent the

(*continued on page 276*)

Notes and Comments

Export Compensations

EXPORTS of British chemical industries have reflected fairly closely the heightened difficulties in overseas markets which have been responsible for the further cut in all British foreign sales to £141.668 million in July. The Board of Trade records of chemical trading, however, serve to remind one how comparatively resilient is this branch of export industry. Comparison of July with the corresponding period a year ago discloses that sales of heavy chemicals, excluding drugs and dyestuffs (£3.56 million), were reduced by almost exactly £1 million, and paints, pigments, etc., were almost halved. Yet the final account for all the combined sections (£6.434 million) was little more than £1 million less that the corresponding total a year ago. Chemical industries, collectively, have a highly developed capacity for recovering on the swings what is lost on the roundabouts. This is apparent both in the capacity of certain groups to compensate with increased trading much of the recession in other sections and in the stabilising effect of varying fortunes in the widespread foreign markets. Thus, while there have been heavy reductions in sales to India, Ceylon, Argentina, the U.S.A., Egypt, Belgium and the Scandinavian countries, chemical sales to British countries, including the African countries, and to Brazil and Iran, have gone far to wipe out the discrepancies.

Italian Initiative

WHEN taking stock of the external factors affecting British chemical trading, insufficient weight would seem generally to have been credited to the reviving forces in Italy. There, many of the crippling political and economic drags are being cast off and the characteristic enterprise represented by such undertakings as the synthetic nitrogen products, which may yield 175,000 tons of nitrate by the end of this year and probably 210,000 tons a year later, is displaying itself in many sections of industrial chemistry, which in 1948, were employing 140,000 workers. Maximum expansion of chemical exports is the declared policy and that objective is being brought appreciably nearer by the imaginative fuel programme, including the wide exploitation of natural methane gas, to overcome the uncertainties of hydro-electric supplies. Emboldened by the yield of 130 million cu. m. of the gas in 1948, largely from Venetia and Emilia, and the prospect that the flow will have been doubled by the end of this year, large industries, such as Pirelli, Marelli and Dalmine, are substituting it for a large proportion of their coal supplies, and entire cities—Verona and Padna among others—have been "methanised" on a very wide scale. The gas in Italy has a thermal value equal to rather more than a litre of high grade liquid fuel of 1.5 kg. of coal, so that the saving which may be effected if this programme for 1000 million cu. m. of the gas by 1952 is carried into effect will be significant. While large reservoirs of methane gas remain untapped, plans are being advanced to provide gas engineering equipment which may later bring to Italian industries a large supplementary source of fuel and some raw material.

American Chemical Plant

THE closer community of interests between British and American chemical process industries is reflected in the current indications that there will be more visitors from this country than ever before at the 22nd Exposition of Chemical Industries in New York this autumn (November 28—December 3). Although this is characteristically American in outlook, conditioned by the needs and economics of U.S. chemical industries, fundamentally the objectives are, of course, very much the same of those of counterpart industries here and there is now a further common ground in the fact that growth of overseas competition and latterly a slackening of buying interest has forced upon U.S. chemical process industries an urgent need to cut costs. The answer in the U.S.A., where labour charges are higher than anywhere else in the world, is normally the installation of new plant or the adoption of new processes, so that this autumn's show is designed to be more than ever an exposition of the progress in chemical engineering and chemical plant production. A large proportion of newly designed plant is being kept under dust covers until the exhibition opens. Some indication of the sectors likely to benefit most from plant research in America is gained by reference to some trading results. Plastics, for example, in their extraordinary varied range of applications, will, as usual, dominate very large sections of process equipment and materials; vast sales commanded by pharmaceutical products are another determining influence. The latter is clearly not an ephemeral effect. In 1947, U.S. penicillin is credited with having earned $87 million, vitamins $35 million and streptomycin $24 million.

More Natural Rubber

EVIDENCE that there is a growing awareness of the danger to natural rubber of the large-scale substitution or synthetic rubber is given in a statement by Mr. Paul Shafer, chairman of the 80th Congress House Armed Services Sub-Committee, the body which helped to formulate the U.S. Rubber Act of 1948. Mr Shafer suggests two major changes in the Administration's rubber policy. He recommends that the Munitions Board should begin at once to purchase natural rubber in large quantities for Government uses, and that the Department of Commerce should reduce the amount of synthetic rubber it requires U.S. manufacturers to use each year, or even cancel the regulation. Although the 1948 Rubber Law seeks to ensure yearly consumption of only 215,0000 long tons of synthetic rubber, its effect last year was to produce consumption of 442,000 tons. America has now been told, by one of its own experts, of the considerable responsibility it bears for its failure to buy the substantial quantities of natural rubber, available at reasonable prices. That is, of course, one of the larger factors in the continuing shortage of dollars throughout Empire countries. The recent announcevent by the ECA mission to the United Kingdom that it has purchased through the London market approximately 21,000 long tons of natural crude rubber, at a cost of about £2.1 million, appears as an encouraging sign that the campaign to "freeze out" the natural product is being moderated.

THE SPANISH EXPERIMENT

(continued from page 274)

syndicates were responsible is not clear—and tariffs, at all events, were probably outside their scope—yet it was manifest that the industrialists had had small reason to like these controls.

The work of the National Institute of Industry (Instituto Nacional de Industria) since its establishment on December 31, 1947, has been described in an official publication of 160 pages (*ION*, July 1949, 446-7). This reflects the emphasis being laid on programmes to develop liquid fuels and lubricants, bituminous shales and lignite. There have been tangible rewards. Nitrogen, activated carbon and artificial fibres are all shown to have received some stimulus under the syndical system and mineral and fishery industries are intended to gain a new important status. The intention is to rebuild Spanish industries on an entirely new basis. That aim would stand much better chances of being realised if the dictators had a clearer appreciation of the great benefits which could accrue if Spain bought more plant, for such things as ammonia synthesis, and less of the finished products.

PRESSURE & VACUUM PLANT

British Standard Tests

ACCEPTANCE tests for positive-displacement compressors and exhausters have just been issued by the British Standards Institution, under BS 1571: 1949.

These British Standard acceptance tests lay down the conditions under which reciprocating and rotary compressors and exhausters shall be tested in order that guarantees made by manufacturers in regard to output, power consumption or speed may be verified.

Deviations of the test conditions from the guarantee conditions within which the tests are applicable are noted and guidance on pressure and temperature measurement is given. A recommended form of test report is also included, together with diagrammatic arrangements of the test layouts for the four types of machines covered.

In drawing up the standard tests every endeavour was made to minimise the corrections which have to be applied to the test results to provide for the deviation between the test and the guarantee conditions. The corrections to power consumption for variations of inlet pressure and pressure ratio are therefore extremely simple, provided that these are within the standard deviation. No correction is applied to power consumption for variations of cooling water temperature within the 15°F. deviation from guarantee conditions permitted.

Varying Factor

Experiments with cooling water temperatures differing by 30°F. have shown that the difference between friction horse power due to the changes in oil temperature which are created through changes in water temperature—for which no correction can be made—have as much influence on the power consumption as the variation in the cooling water temperature.

This standard is to be followed by a further standard which will deal with acceptance tests for aero-dynamic or turbo-type compressors and exhausters.

Copies of this standard may be obtained from the British Standards Institution, London, S.W.1, price 2s. 6d. post paid.

"Polyalkylene Glycols"

The graphical illustration of the hygroscopicity of certain polyalkylene glycols illustrating the article on this subject (THE CHEMICAL AGE, *60*, 220-222) was originally produced by the Carbide and Carbon Chemicals Corporation, U.S.A., producers of the Ucon synthetic materials.

MINERAL DEVELOPMENT

Criticism of Official Report

ONE of the few comments made upon the recently published report of the Mineral Development Committee (THE CHEMICAL AGE, *61*, 137, etc.) comes in the form of a letter from Athole G. Allen (Stockton), Ltd., to the secretary of the committee, Mr. W. C. C. Rose, the contents of which have been communicated by the company to THE CHEMICAL AGE.

This letter, which serves to throw further light on the investigations on which the mineral resources survey was based and upon the enterprise in the same field of at least one private organisation, includes the following observations:—

When we received the first communication, dated May 9, 1949, from you, inviting our approval of the wording relative to our Closehouse barytes mine, we did not understand the report had been signed already—six weeks previous, and that consequently we could not take any part in the inquiry by giving evidence before the committee, nor be recognised or acknowledged in any way.

There is no reason at all why we should have been ignored.

Much of what is said in the report as to the efficient working of mineral resources in this country we have been doing for the past 12 years.

We still have, and regularly operate at our chemical works at Stockton-on-Tees, dressing, processing and grinding plant with a capacity of 400 tons weekly of barium minerals and facilities for extension to double or treble this tonnage.

In 1935 we first approached the New Brancepeth Colliery Co., Ltd., and ultimately persuaded them to restart production. We entered into a long-term contract—still in existence—to take the whole of their output, and in addition to our own requirements we have supplied many thousands of tons to consumers who were temporarily short of supplies.

By the courtesy of The New Brancepeth Colliery Co., Ltd., in company with our barytes mines manager, we have visited the deposits and obtained a very favourable impression of all we have seen. From time to time we have renewed our offer of any assistance if required and/or to take over and work the deposit for our own account if this should be considered at any time.

After much exploration, about 1938 we secured a lease covering 8500 acres in Lunedale, where our Closehouse and our Lunehead mines are situated.

We have constructed a good road two miles long over difficult moorland, erected an up-to-date dressing plant, including power units, hostel and office accommodation, with shower baths, changing, clothes drying, and mess rooms.

All this is well known to various Government departments, trade associations, chambers of commerce, and development boards. Why, therefore, should we be treated as though we counted for nothing?

The ore reserves in the report for Closehouse are calculated on the basis of 100 per cent $BaSO_4$. Conjectural figures have been avoided, but if given would show the reserves to be equal to any other barytes mine in the country.

Had we been invited to give evidence before the committee, we believe we could have made a contribution of value.

The report doubtless will be used as an authority for future references of the barytes industry, and it is reasonable, therefore, that our interests should be adequately stated and not submerged in big sectional interests.

TEES CHEMICAL PROJECT

Inauguration Next Month

WHAT is claimed to be the greatest single project in the expansion of Britain's chemical industry will be inaugurated at Wilton, Middlesbrough, on September 14.

The enterprise, which will have cost £22 million, is part of the Imperial Chemical Industries' scheme for new chemical processing factories being built upon a site of several thousand acres on the south bank of the Tees (THE CHEMICAL AGE, 58, 607).

The opening ceremony will be performed on Wednesday, September 14, by Lord McGowan, chairman of I.C.I., who will conduct a tour of the new plant.

The new installation is a plant to crack petroleum to give a maximum yield of the simpler olefins which will serve as the starting points for the manufacture of a large range of more complicated organic chemicals.

Increased employment will be provided for the area. It is estimated that 3000 people will be employed at an early date, 8000 by 1951, and 11,000 four years later.

U.K. Light Metal Statistics

MINISTRY of Supply statistics relating to light metals in June and the first half of the year have now been issued

These figures are given below (in long tons) in comparison with figures for the same month and first six months of 1948.

	Total for first half 1949	Total for first half 1948	June 1949	June 1948
Virgin aluminium :				
Production ...	15,681	15,240	2,648	2,528
Imports	71.345	69,227	9,236	15,240
Secondary aluminium :				
Production ...	38,017	44,825	6,223	6,403
Aluminium scrap arisings :				
Consumption ..	51,116	49,485	8,167	8,549
Aluminium fabrication	119,941	129,823	19,467	19,566
Magnesium fabrication	1,336	1,420	288	249

New South African Nickel Lode?

The nickel bearing ore deposits in the Insizwa Mountains in Pondoland, Eastern Cape Province, are to be exploited by a Johannesburg syndicate. Permission has been obtained from the Minister of Native Affairs to prospect the area, with authority to acquire a lease. Geologists report that the ore also contains platinum, gold, silver and copper.

STEEL INDUSTRY INITIATIVE

Service to Export Industries

THE story of the country's greatly increased output in the iron and steel industries during the post-war years is told in fuller detail than usual in *Steel News*, issued by the British Iron and Steel Federation.

Imports of iron ore—increased from 4,134,000 tons in 1945 to 8,539,000 tons in 1948—have provided most of the raw material with which production records have been broken, enabling manufacturers to make more goods for export, often, it is stated, at 100 times the value of the ore imported for them.

Compared with the pre-war period. exports of goods using steel have been doubled, until they now represent nearly 50 per cent of Britain's total.

Though large quantities of iron ore are mined in Britain, they contain only 30 per cent or less of iron. Iron ore from overseas generally contains as much as 60 per cent or more. It takes, moreover, nearly as much coal to extract the 30 per cent of iron from English ores as it does the 60 per cent from those imported. Imported ore, therefore, saves thousands of tons of coal.

BISC (Ore), Ltd., is the organisation set up since the war by the iron and steel industry to act for manufacturers, buying ore, arranging shipping and handling many other problems. Substantial savings in the large transactions involved have been made by this arrangement, with consequent benefit to manufacturers.

The industry has taken the initiative by engaging mining experts not only to investigate existing sources of ore, but to explore possible new supplies in different parts of the world.

Mechanical Handling Exhibition

AS a result of the success of the first Mechanical Handling Exhibition held in July 1948, the exhibition is to be repeated at Olympia, London, from June 6-17, 1950.

The next annual display will be larger than the first one, both the Grand and National halls being used, and the run being for 11 instead of nine days. It is hoped that the inclusion of two Saturdays may enable visits to be made by factory managers, foremen, and operatives.

Exhibits will cover the full range of equipment for the handling, lifting, stacking and short-distance transportation of goods.

CHEMICAL EXPORTS FALL

July Total was £512,718 Less than June's

IN common with the general trend of the country's overseas trading, chemical exports from the United Kingdom in July, valued at £6,434,589, were lower than the June figure. The reduction was £512,718 and the total was £1,146,250 less than in July, 1948. Notable decreases from June totals included salicylic acid, from 120,362 cwt. to 85,078 cwt.; ammonium sulphate, 33,262 to 27,865 tons; bleaching powder from 29,752 to 19,429 cwt.; cresylic acid, from 83.565 to 67,351 gal.; collodion cotton, from 3343 to 1741 cwt.; disinfectants, insecticides, etc., from 52,275 to 39,774 cwt.; plastic materials from 33,344 to 27,099 cwt.; chemical glassware, from 1008 to 738 cwt.

The few notable increases included tar oil, creosote oil, etc., from 1,129,355 to 3,011,191 gal.; fertilisers, from 811 to 2317 tons; tetra-ethyl lead, from 86,536 to 152,142 gal.; salt, from 15,321 to 17,767 tons; sodium carbonate, from 150,372 to 266,694 cwt.; caustic soda, from 157,998 to 215.571 cwt. Representative totals are as follows:—

CHEMICAL EXPORTS

	July 1949	July 1948
	Cwt.	Cwt.
Formic acid	4,160	2,172
	Lb.	Lb.
Salicylic acid and salicylates ...	85,078	223,216
Value of all other sorts of acid ...	£60,651	£70,262
	Tons	Tons
Aluminium oxide	26	414
Sulphate of alumina	2,718	2,179
All other sorts of aluminium compounds	1,403	619
Ammonium sulphate	27,805	38,126
Ammonium nitrate	3,216	7,042
All other sorts of ammonium compounds	1,265	1,335
	Cwt.	Cwt
Bleaching powder	19,420	33,386
All other bleaching materials ...	9,073	11,546
	Gal.	Gal.
Cresylic acid	67,351	276,938
Tar oil, creosote oil, anthracene oil, etc.	3,011,191	3,102,099
Value of all other sorts of tar oil ...	£31,215	£142,078
	Cwt.	Cwt.
Collodion cotton	1,741	1,781
	Tons	Tons
Copper sulphate	4,402	2,038
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	39,774	85,194
	Tons	Tons
Fertilisers	2,317	1,832
	Cwt.	Cwt.
Nickel salts	5,990	3,690
Lead acetate, litharge, red lead, etc.	5,680	12,406
	Gal.	Gal.
Tetra-ethyl lead	152,142	65,375
	Tons	Tons
Magnesium compounds	904	879
	Gal.	Gal.
Methyl alcohol	3,850	10,788
	Cwt.	Cwt.
Potassium compounds	5,325	8,635
	Tons	Tons
Salt	17,767	13,987
	Cwt.	Cwt.
Sodium carbonate	266,694	432,545
Caustic soda	215,571	164,562
Sodium silicate	24,001	18,388
Sodium sulphate	62,036	51,512
All other sodium compounds ...	61,707	96,461
Cream of tartar	253	156
Tin oxide	200	661
	Tons	Tons
Zinc oxide	668	1.276
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,560,644	£4,518.233
	Oz.	Oz.
Quinine and quinine salts ...	177,954	199.940
	Lb.	Lb.
Acetyl-salicylic acid	103,639	147,445
	100 International units	100 International units
Insulin	612,891	1,600,312
	Mega units	Mega units
Penicillin	564,271	422,897
Total value of drugs, medicines, and preparations	£1.158,384	£1.267,922
Total value of dyes and dyestuffs	£935.133	£756,655
	Cwt.	Cwt.
Plastic materials	27,099	36,037
Value	£330,977	£452,721
	Cwt.	Cwt.
Chemical glassware	738	1,329
Value	£30,850	£50,147
	Cwt.	Tons
Fans	3,942	234
Value	£104.986	£106,329
	Cwt.	Tons
Furnace plant	6,572	369
Value	£84,100	£97,281
	Cwt.	Tons
Gas and chemical machinery ...	27,813	993
Value	£340.338	£209,126

CHEMICAL IMPORTS

	July 1949	July 1948
	Cwt.	Cwt.
Acetic acid	4,536	24,690
Boric acid	6,180	7,840
All other sorts of acid	8,640	3,506
Borax	19.000	17,728
Calcium carbide	1	4,237
Coal tar products (excluding benzol and cresylic acid) ...	—	11,821
Cobalt oxides	849	679
	Tons	Tons
Arsenic	143	1,230
Fertilisers	200	183
	Lb.	Lb.
Iodine	132,100	66,050
	Cwt.	Cwt.
Potassium chloride	700,963	813,454
Potassium sulphate	33,000	50,900
All other potassium compounds ...	1,525	4,672
Sodium nitrate	35,896	—
All other sodium compounds ...	7,760	3,613
Carbon blacks (from natural gas)	22,179	67,044
Total value of chemicals, drugs, dyes and colours	£1,943,137	£3,095,589

Industry in the German Bizone

Post-War Record for Fertilisers in June

ALTHOUGH a slight decline marked the index of industrial production of the Bizonal area for June, chemicals were one of the four groups which rose (in spite of the shorter month), showing a 2 per cent increase. This is recorded in the *Monthly Report of the Control Commission for Germany (British Element)*, Vol. 4, No. 6 (HMSO, 1s. 6d.).

The general situation in the chemical industry did not alter materially during the month. Good results are looked for from the improved short-term credit position and proposals for long-term loans at reasonable rates. The development in production was uneven, the total rising from 86 per cent to 88 per cent of the 1936 level.

Superphosphates

The output of fertilisers increased, potash rising to 58,200 tons and nitrogen and phosphate fertilisers reaching post-war records at 27,500 tons and 26,600 tons respectively. Stocks of the latter two types continued to increase, notably superphosphates.

Among the basic chemicals, output varied. Sulphuric acid, for which there is an excess of supply over demand, dropped from 78,200 metric tons to 71,600 tons. Calcium carbide rose from 42,800 tons to 45,000 tons—a post-war record. In the alkalis, production of caustic soda declined to 18,000 tons. Production of soda ash declined to 35,800 tons because of sales difficulties, which have led to an offer of some quantities for export.

In the field of finished products, the output of paints, varnishes, and lacquers was almost unchanged at 12,100 tons. Output of soap dropped from 6000 to 5500 tons, but that of washing powders rose from 15,000 tons to 17,100 tons. The manufacture of coal tar dyes rose from 1200 to 1400 tons, but is still below the 1600 tons produced in March.

In glass and ceramics, the same rate of production as in May was maintained.

The index for non-ferrous metals production declined to 75 per cent of the 1936 level, largely because of the shorter working month. There is no shortage of non-ferrous metals. The trade has continued to operate with minimum stocks to avoid capital outlay and the financial risks consequent upon falling prices.

The decline in world prices has passed the level at which lead and zinc mines in the Bizonal area can operate profitably. As a result, the German bizonal authorities have held domestic prices above world prices while an investigation into production costs is made. They are seeking to devise a subsidy method which will maintain the high-cost producers without giving the low-cost producers a windfall.

World prices for lead and copper have hardened recently but zinc remains weak. Zinc and lead were in good demand during June, mainly for building, whereas sales of copper and aluminium were slow. Demand for copper, zinc and lead semi-manufacturers improved during June.

On June 30 the 1948-1949 fiscal year closed with production of ingot steel for the month of June recorded at 750,300 metric tons. The May daily average production rate which was a record figure since the industry was re-started after the war was maintained.

When in January and February, 1948, the original steel plan for the 1948-1949 fiscal year was being prepared, the Military Governors intimated that the time had arrived to concentrate on this basic industry, which in importance ranks second only to coal. They indicated that an ingot steel tonnage of no less than 6 million tons should be set as the target.

The actual tonnage achieved against this target is 7,652,582 tons, which is 127 per cent of the original planned figure. The elimination by monetary reform of so many of the problems retarding production prior to June, 1948, together with the increased availability of raw materials—especially fuel, iron ore and steel scrap—and the improved power and gas situation, have all contributed to this satisfactory year of progress in steel production.

Exports of Gas

Gas produced in June was 122 million cu. metres, giving a total available for disposal and export of 652 million cu. metres, some 33 million cu. metres less than in May, but well above the June, 1948, figure of 500,759,000 cu. metres.

Final figures for May compared with April show increases in consumption by all industry groups except mechanical engineering which fell in spite of a greater number of working days.

The steel, chemical, and glass industries showed the most marked increases.

ALKALI CARTEL DECISION

U.S. Court Ruling Against Leading Companies

ELEVEN of America's largest alkali producing companies, all of which comprise the membership of the United States Alkali Export Association, are ruled to have violated the Sherman Anti-Trust Act by engaging in an international cartel to divide the world's alkali markets in restraint of the trade. This is the effect of a decision by U.S. Federal Judge, Samuel I. Kaufman, in New York.

The decision, which may have far-reaching effects on other export trade associations, relates in particular to the Alkali Export Association, known as Alkasso, and also affects the California Alkali Export Association (Calkex), Imperial Chemical Industries, Ltd., of Great Britain, and the latter's American subsidiary, Imperial Chemical Industries (New York), Ltd.

Other foreign alkali producers involved in the Government's anti-trust suit, named, but not cited as defendants, were Solvay et Cie., of Brussels, and I.G. Farben, of Germany. Producer defendants listed in the Government's case are: Pittsburgh Plate Glass Company, Inc.; Church and Dwight Company, Inc.; Diamond Alkali Company, Inc.; Dow Chemical Company, Inc.; Hooker Electrochemical Company, Inc.; Niagara Alkali Company; Pennsylvania Salt Manufacturing Company; Southern Alkali Corporation; Westvaco Chlorine Products Corporation; Wyandotte Chemicals Corporation; and West End Chemical Company, Inc. The last company is now the only member of Calkex, which formerly was composed of three companies.

Alkali Exports

In the court's decision the defendants were considered to have entered into agreements and engaged in practices to restrict exports of alkalis from the U.S.A.; to have prohibited imports of alkalis to the U.S.A.; curtailed and limited alkali production; eliminated competition; and fixed the prices of caustic soda in U.S.A.

Judge Kaufman has directed Government attorneys to submit findings of fact and conclusions of law in support of the framing of an injunction. The results of the Government's suit are thought to be capable of affecting " every export association which has been organised in the United States since 1918." Among such in the chemical field are the Sulphur Export Corporation (Sulexco), and the Carbon Black Export Corporation (Carboexport). The possible far-reaching effects of the decision would derive from the fact that the current ruling marks the first definite judicial interpretation of the 31 year-old Webb Export Act, which granted associations and combinations of firms engaged in export trade limited immunities from anti-trust laws.

Describing the elaborate system by which Alkasso was alleged to have prevented competitors in America from exporting alkalis, the court decision referred to the existence of an elaborate statistical system to obtain knowledge of all shipments exported by firms outside the association.

Sales in U.S.A.

Alkasso, the decision stated, maintained inspectors at docks within the United States to scrutinise material leaving America. Lists are stated to have been compiled by Alkasso and circulated throughout the association's membership to prevent future sales to such shippers. The decision found that purchasers of alkali in the United States were required to give a written promise that the product would not be sold outside the U.S.A.

With respect to the provisions and aim of the Webb Act, Judge Kaufman said:

" The legislative history of the Webb Act, when considered as a whole, refutes any claim that the act was intended to leave the foreign commerce of the United States free of and unfettered by the anti-trust laws." Holding that the defendants had rigidly regulated the price and supply of caustic soda, the Judge said: " A suggestion is made that the stabilisation of price was not ' artificially enhancing or depressing ' prices. The claim is baseless. Interpretation of the anti-trust laws does not turn upon such semantic niceties."

There was evidence, added the Court decision, that during the war shortages Imperial Chemical Industries and Alkasso employed the cartel as a means of allocating material. " In 1942," it was said, " Alkasso wrote to the (U.S.) Department of Commerce to protest against contemplated State action in dividing the South American markets between Britain and the United States. It is clear, therefore, that the war did not bring about a general abandonment of all cartel practices."

Applied Chemistry at Edinburgh

Ancient University's Services to Modern Industry

THE claim that the Edinburgh University Department of Chemistry Chemical Society was the first chemical society in the world is made in a survey of the department's work in relation to industry, just issued by the University Industrial Liaison Committee. The old barriers between pure and applied chemistry having been largely eliminated, the intention behind this survey is stated to be to advise industrialists of the facilities and people concerned with chemical research in the university, in order to facilitate liaison between university and industry.

Early Leaders

The chair of chemistry in Edinburgh University was originally combined with medicine, the first incumbent being James Crawford (1713). In the latter half of the eighteenth century one of its most distinguished occupants, Joseph Black, first made chemistry a quantitative science, and by his pioneer work on *magnesia alba* established the important conclusion that the " burning " of lime consists essentially in the loss of fixed air, not in the addition of phlogiston. Black's successor in the Edinburgh chair, Thomas Hope, is famous for his discovery of strontium.

Among the professors of chemistry at Edinburgh in the nineteenth century, Lyon Playfair (discoverer of the nitroprussides)—he later became Lord Playfair and, as Postmaster-General under Gladstone gave us the halfpenny postcard —and Crum Brown (who introduced the modern graphical method of writing organic formulæ, and anticipated Bragg by 30 years in presenting the lattice structure of sodium chloride) were particularly noteworthy. Nicol (inventor of the Nicol prism) and Couper (who shares with Kekule the credit for establishing the structure of aliphatic compounds) were students in the department.

Graham also published his law on the diffusion of gases while a student. Dewar discovered the use of charcoal in the production of high vacua and laid the foundation of his later work on the liquefaction of gases and the production of low temperatures while an assistant, and Hugh Marshall, another assistant, discovered persulphates.

In the present century, Sir James Walker, a leading physical chemist of his generation in Great Britain, organised the erection and management, by a staff recruited from the teachers, graduates, and undergraduates of the department, of a TNT factory which, at the conclusion of the first world war, held the record for efficiency of production in the whole United Kingdom.

During Walker's term of office at Edinburgh the present chemical laboratories at the King's Buildings were erected, and the last link with medicine broken by the institution of a separate chair of biochemistry. In 1947 a new professorship of organic chemistry was also established.

The chemical society of the department was existent under the sponsorship of Joseph Black in 1785. The first volume of its proceedings has recently been discovered in the archives of the Royal Irish Academy and restored to the library of the society; it is believed to constitute the first purely chemical journal in the world.

The present staff of the department consists of two professors, one reader, twelve lecturers, and about fifteen part-time assistants who are engaged in research work for the Ph.D. degree. Two I.C.I. Fellows are undertaking more advanced research. The staff is frequently called upon to advise Government departments, industrial firms, and private individuals on problems connected with all fields of chemistry—inorganic, physical, organic, analytical, and technical.

Research Programmes

The main lines of research undertaken by the staff include electrical conductivity of solutions, viscosity of liquid mixtures, formation of addition compounds, separation of isotopes, gas warfare, chemistry of the carbohydrates, with special reference to vitamin C and the polysaccharide group (cellulose, starch plant germs and mucilages), chemistry of explosives, researches on sugars, cellulose, and seaweed polysaccharides, and methods worked for estimating the chief carbohydrate constituents of Scottish seaweeds. Research into the properties of colloidal systems (soaps and other colloidal electrolytes, gelatin, colloidal sulphur, etc.), and surface chemistry (adsorption, surface films, etc.), reaction kinetics and methods of inorganic analysis, especially microchemical procedures, is also being undertaken.

SHALE-OIL FUEL RESEARCH

Opening of U.S. Experimental Refinery

WITH the completion of the first continuous shale-oil refinery in the U.S.A., the U.S. Bureau of Mines announces that the new 200-barrels-a-day experimental unit near Rifle, Colorado, has been put " on stream " without difficulty. A highly flexible, continuous unit, the refinery is designed to produce motor spirit, diesel fuel, heating fuels, and fuel gas from crude shale oils extracted at the bureau's oil-shale demonstration plant. It was built at a cost of $244,912.

Technology and Cost

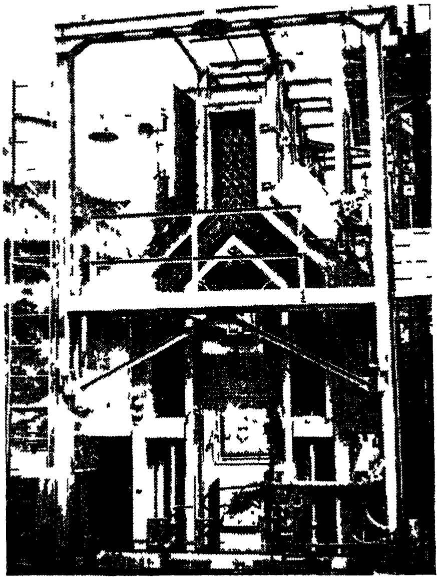
The commercial utilisation of America's gigantic oil-shale resources is a three-fold problem, the bureau states, involving mining the shale, retorting the shale to produce oil, and refining the crude shale oil into useful products. The operation of this new experimental unit, under the bureau's synthetic fuels research and development programme, is expected to answer for private industry some of the technical and cost questions of shale-oil refining. The mining problem has been largely solved, for the bureau's experimental oil shale mine has already achieved low-cost production. Work on the retorting problem is also well advanced.

All the bureau's installations near Rifle, Colorado—the mine, retorts, and refinery —will be on exhibition on September 20 and 21.

Major items of equipment include a furnace or heater, two coking chambers, a combination flash vaporiser and fractionator, stripper for the diesel fuel fraction, stabiliser for the naphtha fraction, absorber, and a re-run column for acid-treated motor spirit. With only minor changes, the same equipment can be used for atmospheric distillation, delayed coking, single coil re-cycle cracking, or reforming. Facilities are also available for chemical treating of distillates.

In both function and design, the fractionation section is conventional. Heavy fuel residium is withdrawn from the flash vaporiser at the base of the fractionating tower. Gas oil and diesel fuel are taken off as sidestreams from the fractionator, and the diesel fuel is stripped of its light components before being stored.

The motor spirit fraction is taken overhead as a vapour and condensed. Uncondensed gases go to the absorber, where the condensible hydrocarbons are recovered and returned to the fractionator. Condensed motor spirit is pumped to the stabiliser for removal of excessive quantities of butanes and lighter hydrocarbons, and the stabilised motor spirit is then sent to the chemical treating unit.



Close-up of thermal cracking unit furnace designed for most conditions in liquid- and mixed-phase cracking, including reforming

In the treating unit, the distillate first receives a dilute caustic wash for the removal of hydrogen sulphide, light mercaptans, and tar acids. This is followed by a dilute sulphuric acid wash for the removal of nitrogenous compounds in the form of tar bases. Thus freed of its chemically active compounds, the distillate is then subjected to three stages of counter current extraction with concentrated sulphuric acid for sulphur removal, improvement of colour, and oxidation stability. Next it is washed with water and neutralised with a final dilute caustic treatment. The distillate is re-distributed to remove the polymers formed in acid treating, and the specification end point distillate is returned to the treating plant for " doctor " sweetening.

Chemical Processing of Wood

Technical Advances in a Widening Field

by ERIK HÄGGLUND*

WOOD has been important, if not essential, throughout history—first as a fuel and later for the construction of homes, household utensils, ships, etc.; still later for the preparation of charcoal which for a long time was prerequisite for the manufacture of metals, especially iron. Large amounts of wood have been used, and are still being used, for railway ties, poles and props.

The latest development has been the use of wood as a fibre material, and in this case both chemical and mechanical methods have found an ever increasing use.

Industrial Development

These endeavours can be traced far back in history, but the question first became of great importance only about a hundred years ago, at a time when general industrial development, especially in the field of organic chemistry, began in earnest.

For many decades these attempts were empirical and clumsy, but were followed, later, by a realisation of the pressing need for a greater knowledge of the morphological construction and chemical composition of wood. This was especially true regarding the chemical reactions that occurred during the manufacture of paper pulp by the sulphite and sodium processes which had been discovered in the 1850's. This industry was destined to become, in the next half century, the most important in the chemical field as far as product value is concerned.

This, I admit, is quite surprising when one considers the size and importance of, for example, the oil and sugar industries. The production is continually increasing and will continue to increase, due to the ever increasing use of wood for new purposes such as paper supplies and cellulose products. There are countries which still consume very little of these products but which, in the future, will find greater and greater need for them.

Parallel to the great increase in pulp production has been the improvement in manufacturing methods. Of great importance has been the introduction of chemical control methods and an increased knowledge of the chemical course of the cooking process.

For a long time, many mills prepared specific types of pulps on the basis of empirical experience. In some cases this method is still used. When, however, the production of many types of cellulose for different kinds of paper, was to be accomplished, it was found that a more exacting reaction control was necessary.

This disclosed a fact of which we were apparently quite ignorant; namely, how unevenly the pulping process took place in different parts of the digesters, due to the lack of circulation of the cooking acid and the resulting temperature gradients. In this way the necessity of forced circulation was realised. After this problem had been solved, it was possible by analysis of the cooking acid and pulp samples to maintain the entire cooking process under complete control.

Other advantages followed, such as the ability to fill the digester with a large amount of chips without risking variations in the degree of pulping. Thus, it was possible to reduce considerably the amount of steam used and thereby obtain a waste liquor containing a much larger amount of organic substances.

The actual chemical reactions occurring in a cellulose cook had been, even at the turn of the century, only slightly investigated and knowledge regarding them was very vague. The cause of unsuccessful cooks, which occurred quite often then, and even occasionally now, especially in the preparation of sulphite pulps, was unknown. The research work of Peter Klason was a great contribution in this field. Still further research has been accompanied by a great reduction in the number of these unsuccessful cooks, so that they are now seldom seen.

Chemical Reactions

This could naturally only be accomplished by an investigation of the chemical reactions taking place during a cook. In the case of sulphite digestion, it was first necessary to determine the reaction mechanism of lignin dissolution.

It had been discovered very early that sulphite waste liquors contained a sulphonic acid of lignin. It was taken for granted that as fast as the lignin in the wood reacted with SO_2 a water soluble lignin sulphonic acid was formed. The course of the reaction is, however, not so simple.

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* In a paper delivered by Prof. Erik Hagglund, of Sweden, at the World Forestry Congress held at Helsinki last month.

Investigations made in the beginning of the 1920's showed that the primary reaction product was a solid lignin sulphonic acid which became soluble only after a simultaneous hydrolysis. The speed of both of these reactions depends on the prevailing hydrogen ion concentration.

Both the solid and soluble lignin sulphonic acids are strong acids—comparable to strong mineral acids. They condense very easily at higher temperatures and the acid thereby becomes insoluble and darkly coloured. This is the cause of the so-called "burnt cook."

Wood also contains, in addition to lignin and cellulose, the so-called hemi-celluloses or wood polyoses. Among the latter, there are some that are easy and some that are difficult to hydrolyse. Both the lignin and the wood polyoses hydrolyse during the sulphite process, which occurs in a relatively acid state.

Importance of Temperature

The relative speeds of these two reactions is decisive for a yield of pulp having a certain lignin content. The cooking acid's content of lime and free sulphurous acid acts as a regulator for both the sulphonation and hydrolysis reactions. The temperature also apparently plays an important part.

It might also be added that the lignin can be sulphonated to a more or less high degree in the solid state. It has been found that a highly sulphonated lignin sulphonic acid, such as is obtained with a high lime content, hydrolyses more easily than a weakly sulphonated one.

This behaviour explains the fact that a greater yield of pulp, with the same degree of delignification, is obtained from a cooking acid having a high lime content than from one having a low lime content.

A fundamental question that still cannot be considered as answered is the reaction between the lignin and the sulphite, or the sulphurous acid. We have good reasons for believing now that sulphonation takes place in different ways. There is certainly a group in the lignin that has strong condensation tendencies. This group easily reacts with sulphite under both acid and neutral conditions.

It has been found by analysis that there is one such group per 4 lignin units—corresponding to 40 carbon atoms and 4 methoxyl groups. The molecule is, nevertheless, still labile even after this sulphonatable group has reacted.

The free acid thus condenses very easily by heating to over 100°C. A stable condition is reached only after the sulphonation has progressed to the point where the lignin sulphonic acid formed has 2 sulphur atoms per 40 carbon atoms. Such an acid can, in lignin-rich pulp, be so stable that it is only partly condensed by 70 per cent sulphuric acid, which is generally used for the analytical determination of lignin.

Delignification of Pine Hearts

These relationships also explain why it is impossible to prepare sulphite pulp from pine heart wood. This fact was earlier explained by an assumption that the pores of the heart wood were more or less clogged by resin and that this hindered the diffusion of the cooking acid in the wood. At the time this explanation seemed acceptable.

Later, it was found that even after extraction with ether or benzene, which completely dissolve resin and fats, it was still impossible to delignify pine hearts. The belief was then advanced that the wood in pine hearts had been so changed by age that it was not possible to prepare pulp from it. This view, however, lost all meaning when we showed that the benzene-ether extracted heart wood could be easily delignified if it was extracted with alcohol or acetone before cooking.

It was apparent that by this extraction certain substances, which hindered cooking, were removed. It was found that these substances were not resins or fats but rather consisted of two different types of phenolic compounds. It could also be established that phenols, especially of the resorcinol type, can themselves generally condense with lignin in as acid a reaction as is found in a normal sulphite cook.

The Lignin Molecule

If, on the other hand, the pine hearts are treated first with a neutral or moderately acid sulphite solution at a high enough temperature the above mentioned easily condensable and sulphonatable groups become fixed, and the phenolic groups no longer have an injurious effect on the sulphite cooking.

It must, however, in this connection be emphasised that we do not yet know definitely the details of the constitution of the lignin molecule, nor can we say with certainty what kind of group in lignin reacts with the sulphite.

Another interesting question that we have studied is whether the lignin in different layers of the fibres is attacked and dissolved uniformly. It is necessary, before the solution is given, to point out that it was already believed that the lignin was very unequally divided in the different layers. That is to say, the lignin was very strongly concentrated in the middle and primary lamella and only a small amount was to be found in the secondary wall.

It is now known that the lignin in the middle and primary lamella dissolves relatively faster than the rest. The sulphonation reactions thus appear to originate in the outer layers of the fibre.

The chemical processes that occur in the soda cellulose processes, particularly the sulphate method, are likewise insufficiently studied, even though we have recently been able to make some noticeable improvements in this field.

Increased Solubility

A sulphide containing sodium hydroxide is more favourable for the digestion of lignin than pure sodium hydroxide is. This we interpret in the following manner: The sulphide reacts with the lignin to form a so-called "thio-lignin" which has a greater solubility. This increased solubility is probably mainly due to the fact that the previously mentioned reactive groups in lignin add sulphur and lose thereby a large amount of their condensation tendencies.

These reactions take place in the solid phase, that is, in the wood. A shorter time is required to dissolve such thio-lignin in a sulphate cook than the condensed lignin in a pure sodium hydroxide cook. Thus the cellulose fibres are not exposed as long to an alkali action, which tends to make the fibres brittle during the beating process and results in a greatly diminished mechanical strength.

If the chemical course of the cooking process is of such great theoretical and practical importance, this also must be true of further treatment of the pulp, such as bleaching and other related chemical operations.

Our knowledge of the reactions occurring during bleaching has been greatly advanced during the past 20 years, and has lead to revolutionary changes in cellulose technique. Especially important has been the bleaching with chloride. I should perhaps use the words "further delignification" instead of "bleaching" since the latter term has a connotation of increased whiteness. It has actually been known for a long time that chlorine, especially in combination with alkali treatment of the chlorinated pulp, can convert lignin into water soluble products.

After good technical methods for chlorine treatment had been found, it was possible to utilise to advantage what had previously been called "non-bleachable pulp," or in other words pulp with a high lignin content. After a good deal of experimentation, methods were found to utilise this in the preparation of pulps of highest whiteness and with strength properties that were equal to, or perhaps insignificantly less than, the unbleached pulp.

This technique was especially of great importance in the bleaching of kraft pulps. In this case it was found necessary, however, in order to obtain pulp of great whiteness and strength, to use chlorine dioxide in the final stages of the bleaching instead of hypochlorite. This compound had not previously been used as a bleaching agent. It was also found that the chlorine treatment could be made more effective by combining it with a hypochlorite oxidation.

These developments in the bleaching field have also facilitated the manufacture of new types of bleached paper pulp from birch by the sulphate process.

Chemical research in the field of pulps for chemical uses, so-called "dissolving pulps" has been no less intensive than in the field of paper pulps. Such pulps are mainly prepared by the sulphite method. To a lesser extent, alkali digestion has been used, but only in connection with so-called "pre-hydrolysis." In either case it is desired to remove, as much as possible, the hemicelluloses and at the same time degrade the cellulose; and by different kinds of alkali treatment to adapt the pulp to any particular purpose.

Preparing the Pulp

It is obvious, from the above, that the manufacture of such pulps involves many different types of chemical reactions, where broad chemical control is necessary. This control has caused, with a certain justification, a feeling that the preparation of pulp in such mills is nothing other than a big laboratory experiment.

Actually only a relatively small part, about 5 per cent, of the world's total pulp production is used for chemical purposes. There is, however, reason to believe that this consumption will increase, perhaps not in proportion to other types of pulps, but nevertheless to a considerable extent. This belief is based on the fact that in the field of artificial fibres, such as viscose and acetate silk, where this pulp finds its greatest use, there is, at present, a constant improvement in quality and, at the same time, a substantial decrease in manufacturing costs.

Considerable progress has been made regarding the use of by-products from pulp manufacturing. The most important of these has been the preparation of sulphite alcohol. The sugar content in the waste liquor, which is the starting point for this manufacture, costs practically nothing. The greatest cost factor is connected with the consumption of steam in distillation, and is relatively high, due to the waste liquor's low alcohol content after fermentation. It could, on the other hand, be reduced considerably by a combination of alcohol manufacture and the evaporation and burning of waste liquors.

Much work has been done in attempting to find the most favourable conditions for obtaining the highest possible alcohol yield on fermentation. Strangely enough, it has been found to be dependent in various ways on the waste liquor itself. Above all, it is a question of the acidity of the waste liquor during fermentation.

Without going into details, it can be said that waste liquor from the manufacture of dissolving pulp should be fermented at a considerably higher acidity than the lignin from "hard pulps." Further, it is of importance that fermentation should take place with the largest possible amount of yeast. This can be arranged, for example, by returning to the fermentation vat some of the yeast obtained from already fermented liquors by centrifuging.

Source of Many Products

The use of sulphite alcohol as a motor fuel is, in itself, a large topic and cannot be discussed in detail here. On the other hand, there is good reason to point out the importance sulphite alcohol has obtained as a raw material for the manufacture of many chemical products of great value, such as glycol, ethylglycol, butanol, acetic acid, chloroacetic acid, esters, acetaldehyde, etc.

In a few mills, the sugar content of the waste liquor has been used for the production of ordinary yeast, while several other mills have utilised these sugars for the production of fodder yeast. It is questionable whether or not this latter manufacture will be lasting, unless, as is the case in America to a certain extent, it becomes of primary importance to obtain a completely sugar-free liquor which is less harmful with respect to water pollution. Fodder yeast is, however, a highly valued product during times of crisis in countries having an insufficient protein supply.

The lignin sulphonic acid in the waste liquor has not, as yet, obtained any large scale use. Only small amounts are now used, for example, for the preparation of tanning agents or vanillin. Attempts are being made to utilise lignin sulphonic acid as soil improving agents, and for the production of ion exchangers and synthetic resins. The most important possible use would be to utilise lignin's basic phenylpropane character and to obtain from it, by new methods of decomposition, chemical products of diverse practical use.

An Old Problem

At present the considerably simpler question of utilising sulphite waste liquor as a fuel after evaporation is of great economic importance. This is an old question. Only during the last few years, however, has it advanced to the point where it may be considered solved from both the economic and technical point of view.

The great difficulty has always been the deposition of gypsum scales during the evaporation procedure. It now appears as if this difficulty can be overcome by suitable heat exchange in combination with pressure heating of the liquor during the intermediate stages.

After methods were found, by which it was possible to burn the concentrated waste liquors and to remove from the waste gases a large portion of their sulphurous acid content as well as their content of light gypsum dust, the problem of utilisation of sulphite waste liquor as a fuel could be considered solved. This implies, under the most favourable conditions, self-sufficiency with regard to fuel, or, under less favourable conditions, a reduction in coal consumption by at least half of that previously required.

With regard to the by-products of the sulphate industry, the most important progress has been made in utilisation of the so-called "tall-oil." The first practical results in the field were obtained in Finland and they were carried on here for a great many years before they were taken up by other countries. Those which should be particularly stressed, in this connection, are the improved methods of distillation and the separation of the fatty and resinous components. The first have found important usage in the manufacture of soap, and the latter, above all, in the sizing of paper.

In America attempts have been made to utilise the well-known method of precipitating lignin from black liquor with carbon dioxide. It has been found that this lignin product can be used as a thermoplastic material, together with different types of fibres or paper, for the preparation of hard plates and press board.

The saccharification of wood has always been of interest, but becomes during time of war or blockade, of vital importance. This is based, in some instances, on a necessity for a relatively cheap substrate for the fermentative production of alcohol or for the production of yeast, including fodder yeast, and in other instances, on a necessity for sugar.

There are, at present, two different methods for wood saccharification. The first is hydrolysis with dilute mineral acids at high temperatures, and the second, hydrolysis with concentrated hydrochloric acid.

Methods Compared

The first method is more appropriate if it is desired to produce alcohol exclusively. If, on the other hand, it is mainly desired to produce sugar, then the second method, in my opinion, deserves preference.

The alcohol here has to compete with sulphite alcohol, in which case, as was said before, the saccharification process does not cost anything. Since it is necessary to operate at low sugar concentrations in order to obtain a satisfactory alcohol yield, the distillation costs for the acid hydrolysis method will not be any lower than those in the sulphite alcohol process. It was probably this fact that caused a plant using the so-called Scholler method in the United States to close, while the newly started sulphite alcohol manufacture has apparently been able to compete with the other methods of alcohol production.

Sugar Production

The hydrochloric acid method is used in two German plants. In one, the sugar is used only for the preparation of fodder yeast with an annual production of about 6000 tons. In the other the main production is pure crystallised sugar with a present production rate of 500 tons per month. It is obvious that this method of refining constitutes a profitable procedure. In this connection the question can be raised as to whether sugar obtained from starch by a similar production method, usually called dextropur, can be produced more cheaply than wood sugar.

Another field that might be included under chemical wood utilisation is the destructive distillation of wood. This once flourishing industry has declined sharply since charcoal has found less and less use in the manufacture of iron. This decline will probably continue and it is very possible that the industry will cease altogether.

On the other hand, it should be pointed out that wood tar, especially that obtained from tree stumps, was found during the blockade to be a valuable raw material for, above all, the preparation of lubricating oil. Wood tar oils have, furthermore, found use during the war in hot bulb ignition motors. The other chemical by-products, acetic acid, acetone and methanol, have lost their previous market. Attention should be drawn, in this connection, to the fact that generator gas, prepared from charcoal, was found, during the blockade, to be a life saver for motor traffic.

In conclusion it may be stated that chemistry's part in the different wood utilisation processes has become more and more important and, in certain cases, has dominated all else. Future development must more and more be concentrated on qualitative improvements rather than quantitative expansion, due to the insufficiency of the world's wood supply. Under these conditions we can say with certainty that chemistry will improve upon its already important position in the field.

Low-Pressure Liquid Methane

THE great development of the production of methane gas in Italy—130 million cu. m. last year and probably 300 million cu. m. this year—has intensified the problem of transporting this fuel. The network of pipe-lines is growing; there were 35 miles of such pipe-lines in 1939, while today there are 450 miles, and in 1952 this figure will have been increased to 975 miles. Pipe-lines, however, do not generally reach individual consumers and the traditional method of using steel containers resisting a pressure of some 175 atmospheres limits widespread economical use. There are, moreover, only some 150,000 such containers in the country.

One solution is to liquefy the gas. The early procedure of the German technicians required compressing the gas at 200 atmospheres. Later, French scientists accomplished the liquefaction at 40 atmospheres. It is now announced that Italians have succeeded in liquefying methane at the pressure of only 8 atmospheres, and it is thought that this may be further reduced. Every cubic metre of liquid methane represents some 600 cubic metres of gas.

Technical Publications

VIBRATIONS in engineering and torsional problems are the subject of a general survey by R. G. Manley in *Torque* (*1*, 2), the September issue of the Development Journal of Silentbloc, Ltd., and the Andre Rubber Co., Ltd. Among other articles James Lawrie (British Rubber Development Board) deals with "Rubber Linings in Pipes and Tanks," and the Marconi Electroencephalograph is described.

* * *

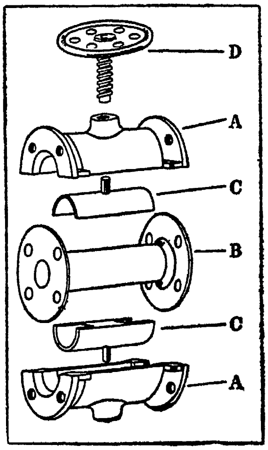
VARIED uses of Monel, showing its application to such diverse subjects as foundry practice, bee-keeping, oil and petrol strainers, laundry equipment, food containers and water distillation are described in illustrated articles in the August issue of "Wiggin Nickel Alloys" (formerly "Monel Notes"), issued by Henry Wiggin & Co., Ltd., Birmingham. Other features deal with the use of Inconel, cupro-nickel and thermometals.

* * *

TWO types of direct-reading dynamic electrometer—a millivoltmeter for laboratory measurements and a dosimeter for X-rays—are described in an article by J. van Hengel and W. J. Oosterkamp in *Philips Technical Review* (Vol. 10 No. 11), now available from Philips Electrical, Ltd., London. Other features include a system for the circuiting of fluorescent lamps in coal mines, which precludes the risk of explosions, and abstracts of recent scientific publications of the N.V. Philips' Gloeilampenfabrieken.

* * *

WITH his tools in daily use in subjects as far removed as neurology and radar the modern electrical engineer may be forgiven if he boasts that he can measure anything from a flight of fancy to the flight of a shell. It is fitting, therefore, with the meeting next month of the British Association, which has always encouraged electrical measurement, that the current number of *Technique* (Vol. 3, No. 3), published quarterly by Muirhead & Co., Ltd., should devote its introduction to the advancement of science and its articles to commonplace unspectacular laboratory instruments that have contributed in no small measure to that advancement Subjects include: "The Owen Bridge for Testing Magnetic Materials"; "The Frequency Bridge," and "Universal Units."



A simple valve for chemical uses, providing a full bore and a passage for liquids unimpeded by glands or pockets. One stock range is said to be capable of use with most gases and liquids (Warren, Morrison, Ltd.)

THE problem of keeping abreast with latest medical and chemical developments in veterinary science is facilitated by the periodical issue of a series of pamphlets by Evans Medical Supplies, Ltd., Speke, Liverpool. Two new publications are "Medical Products of Interest to the Veterinary Profession," and "Procaine Penicillin Intramammary Injection for the Treatment of Bovine Mastitis," while reprints include Hæmorrhage septicæmi and Fowl Cholera Serum and Vaccine; Calcium Borogluconate for hypocalcæmic diseases, and Tetanus Antitoxin.

* * *

"GERMAN Steel at the Cross Roads" is the subject of the main article in the *Monthly Statistical Bulletin* for July (*24*, 7), published by the British Iron and Steel Federation. It is also announced that coloured charts (20 in. by 30 in.), which have appeared in recent issues of the *Bulletin* may now be obtained as follows: Steel Production, 1948; Margins of Firms for Home Deliveries of Certain Products; British Iron and Steel Federation; U.K. Steel Production and Capacity; U.K. and World Steel Consumption; Proportion of Iron and Seel Industry to be Nationalised.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

PLANS for introduction in England of the low-pressure air conveyor system developed by the Convair Corporation of Pittsburgh, Pa., have been announced by the company. The Convair system, developed during the past four years and claimed to permit an exceptionally large ratio of product to air volume, will be a feature of the new plant of Jackson Brothers, Ltd., bottle manufacturers, at Knottingley, England. In this factory, glass batch and all raw materials will be carried by low pressure air. Jackson Brothers previously made a successful trial of the system in another plant. Mr. J. Bozich, president of the American firm, is now in England and is expected to license the Convair system to British manufacturers serving the ceramic and coal industries. The system uses balanced pressure to saturate the air stream completely with the conveyed material.

* * *

Owned by the U.S. Government, to whom it was assigned by the inventors, Henry H. Storch and Lester L. Hirst, U.S. Patent No. 2,464,271 (March 15, 1949), covering liquefaction of coal by hydrogenation, has been made available by the Department of the Interior on a non-exclusive and royalty-free licence basis. The process relates to production of fuel oil from coal. The latter is mixed with a liquid vehicle and a dispersed catalyst is heated to at least 300°C. and introduced, together with excess hydrogen, into a closed reaction zone maintained under an elevated pressure of not more than 90 atmospheres. The temperature is progressively raised to a final range of not more than 475° C.

* * *

A relatively new anti-malarial insecticide, known as "Pamisc," stated to contain 75 per cent DDT, has been developed by the Pennsylvania Salt Manufacturing Company, Philadelphia, Pa. Besides providing uniform suspensions, it is claimed that this insecticide has eliminated the problem of the obstruction of spray nozzles, stated to have been a difficulty with ordinary wettable powders. Large quantities have been supplied to Venezuela, where it is said to have been used very effectively, its high concentration considerably easing the difficult transport problems involved there.

Construction of five new plants to process powdery iron ore to usable size and to recover iron from blast furnace flue dust is to be undertaken shortly at strategic centres by steel producing subsidiaries of the United States Steel Corporation. Completion of the new facilities will add some 1.8 million tons net to the high grade iron ore annually available for United States Steel blast furnaces without requiring an equivalent increase in iron mining. Large sintering plants of advanced design will be built at the Gary, Indiana, and South Chicago, Illinois, plants of the Carnegie-Illinois Steel Corporation, as well as at the Edgar Thomson and Carrie Furnace plants of that company in the Pittsburgh district. A fifth sintering plant will be installed at the National Works of National Tube Company at McKeesport, Pennsylvania. The new sintering plants will recover the substantial quantities of iron values present in flue dust and sludge recovered from the dust catchers and gas washers, respectively. Flue dust has an iron content of approximately 50 per cent. The importance of these facilities is apparent in the fact that over a period of ten years a metal loss of approximately 3 million tons is attributed to the neglect of fines in iron ore.

* * *

Large-scale production of the rare gases krypton and xenon by Linde Air Products Company, a unit of Union Carbide and Carbon Corporation, has brought about price reductions sufficiently large to encourage wider use of the hitherto expensive gases. Krypton in the atmosphere represents about one part in one million, and xenon one part in 12 million. Their separation and purification have presented complicated problems. It is expected that many diverse products and processes may now be improved by using xenon and krypton. Nitrogen users are expected to investigate the advantages of the rare gases, since they are inert and will not combine with other elements under any conditions while nitrogen (although considered inert) will unite with many elements at high temperatures. Xenon and krypton also have lower electrical resistance, lower thermal conductivity and lower ionising potentials than argon, the most widely used rare gas.

◆ HOME ◆

Chemistry of Oils and Fats

A course of 12 post-graduate lectures on the modern chemistry of oils and fats is to be held at the Acton Technical College, London, W.3. The course will be held on Friday evenings at 7.30 p.m., beginning September 23, the fee being one guinea.

Coal Output

Production of coal in Britain last week showed a total increase of 61,000 tons over the previous week. Comparative figures are:—Last week: 4,014,000 tons (3,752,000 tons deep-mined, 262,000 tons opencast). Previous week: 3,953,000 tons (3,706,000 tons deep-mined, 247,000 tons opencast).

Industrial Finishes

The first exhibition to be devoted to displaying the high standard of finish achieved in British goods is planned to be held at Earls Court, London, in September next year. A scientific congress on industrial finishing is to be held at the same time as the exhibition.

Visit to Lavender Distilleries

An enjoyable outing to Hunstanton, Norfolk, was made recently by 18 members of the Royal Institute of Chemistry (London and South Eastern Counties section) when they visited the 50-acre lavender field of Yardley & Co., Ltd., and watched the process of steam-distillation which is carried out within 48-hours of cutting the lavender.

Electronics and Industry

A symposium on the application of electronics to research and industry, sponsored by the electronics section of the Scientific Instrument Manufacturers' Association will be held at the Examination Hall, Queen's Square, London, W.C., from Wednesday to Friday, November 2-4. Besides the technical papers and discussions there will be a display of the latest types of British scientific and electronic instruments.

Scottish Lead Mining

Lead mining has been revived in Kirkcudbrightshire near Newton Stewart. The country was at one time a rich mining area until large scale overseas production brought about a decline in the mining industries carried on in the Stewartry at many points on the river Cree. Reserves are not equal to continuous operation, but, while prices are high and supplies from home sources limited, the present activity is profitable.

Iron from Calcutta

The steamship *Indian Shipper* last week discharged at Newport, Monmouth, 3296 tons of machine-cast pig iron, the first post-war consignment from Calcutta, for the Richard Thomas and Baldwins works at Ebbw Vale and Panteg.

Polythene Equipment for Poland

The Polish Government has ordered nearly £4000 worth of polythene tubing and fittings from Tenaplas, Ltd., extruded plastics manufacturers, of Upper Basildon, Berks. It is understood that the piping will be used in a vinegar-making plant.

Sir George Beilby Awards

The administrators of the Sir George Beilby Memorial Fund, the Royal Institute of Chemistry, Russell Square, London, W.C.1, have invited notifications of work of exceptional merit in fuel economy, chemical engineering or metallurgy which may qualify for a memorial fund award in 1950.

Savings in Industry

The chemical industry is rated fifth among the groups with highest percentage of industrial savings in concerns employing more than 500 people. According to figures issued by the National Savings committee, average savings per group member in the larger concerns of the chemical industry for the June quarter were £3 19s. 5d.

Research Scholarships

The Pharmaceutical Society's research scholarships for 1949 have been awarded as follows: *The Pharmaceutical Society Scholarship*—Mr. B. K. Martin, B.Pharm., at Nottingham University. *The Ransom Fellowship*—Mr. R. A. Webb, B.Pharm., B.Sc. (Hons; special chemistry), at the School of Pharmacy, University of London.

Overseas Standards Recorded

It appears that it is not sufficiently well known that the British Standards Institution acts as the agent in the United Kingdom of all overseas national standards organisations. At the present time, when every possible avenue for export is being explored, many concerns write directly to standards organisations abroad only to be referred to the BSI, to whom, it is suggested, application should be made, at 24/28 Victoria Street, London, S.W.1, for all information regarding standards, both home and overseas.

· PERSONAL ·

MORE than 700 members representing 42 countries attended the first International Congress of Biochemistry held at Cambridge this week. Among the distinguished members on whom honorary degrees were conferred at a special Congregation in the Senate House were: LORD ADDISON, Lord Privy Seal; PROF. C. F. CORI, of Washington University School of Medicine, noted for his work on enzymes and on insulin; SIR CHARLES HARINGTON, director of the National Institute for Medical Research, for his investigations on thyroid glands; DR. KAJ LINDERSTROM-LANG, for whom the Carlsberg laboratory, Copenhagen, was founded in appreciation of his work; PROF. ARNE TISELIUS, of the Royal University of Uppsala, and DR. JACQUES TREFOUEL, director of the Pasteur Institute.

The Priestley Medal of the American Chemical Society has been awarded to DR. ARTHUR B. LAMB, of Harvard University, who for 30 years has edited the *Journal of the American Chemical Society.* Dr. Lamb is to receive the medal at the society's 116th national meeting this Autumn, and will retire from his editorial post at the end of the year.

MR. LESLIE MCARD, Lytham St. Annes, managing director of Robert McArd & Co., Ltd., plastic moulders, Crown Point, Denton, Manchester, left £131,292 (net £122,126).

DR. IRVING M. KLOTZ, 33-year-old Illinois chemist and associate professor of chemistry in North-western University, whose pioneer research on proteins may help explain the basic effectiveness of sulpha drugs and similar biochemicals, will receive the $1000 Eli Lilly & Company award in biological chemistry at the 116th national meeting of the American Chemical Society, which opens in Atlantic City, New Jersey, on September 18. His recent work has been devoted to analysis of the bonds linking proteins to other substances, and an incidental result of these studies has been new insight into the molecular patterns of the proteins themselves.

The Textile Institute has awarded a £1000 Open Scholarship to GEOFFREY ROBERT HAINES, aged 19, of Redditch, Worcs. This is the first such scholarship offered by the institute to young persons in any section of the textile industry and to senior students in their final year at school. The successful candidate was selected from a list of more than forty applicants. The award will enable Mr. Haines to take a degree course in Textile Engineering at Manchester College of Technology. A further £750 Cotton Industry War Memorial Trust Scholarship—the seventh such—has been awarded by the Institute to JOHN CLIFFORD HILTON, aged 21, Chorley, Lancs. He will complete preparatory studies at the Preston Harris Institute before taking a degree course at Manchester College of Technology in October, 1950.

Members of the Pharmaceutical Society recently held a dinner in London to celebrate the 80th birthday of their colleague, MR. A. R. MELHUISH. Among those who paid tribute to him, were Mr. H. Clement Shaw, president, Mr. H. N. Linstead, joint-secretary, and Mr. Rupert Woolby Brooke, chairman of the West London branch of which Mr. Melhuish is a member.

CAPTAIN F. H. THORNEYCROFT has tendered his resignation from the office of deputy chairman of the Scottish Divisional Coal Board with effect from the end of this month. He is taking up an appointment outside the coal industry.

VISCOUNT LEVERHULME has been appointed advisory director of Lever Brothers and Unilevers, Ltd.

Chemical Society Grants

THE Research Fund of the Chemical Society provides grants for the assistance of research in all branches of chemistry. About £700 per annum is available for this purpose, the income being derived from a donation of the Worshipful Company of Goldsmiths, from the Perkin Memorial Fund, and from other sources. Applications for grants will be considered in November next and should be submitted on the appropriate form not later than Tuesday, November 1. Applications from Fellows will receive prior consideration. Forms of application, together with the regulations governing the awards of grants, may be obtained from the general secretary, the Chemical Society, Burlington House, Piccadilly, London, W.1.

◆ OVERSEAS ◆

U.S. Steel Mill for Jugoslavia

President Truman has given instructions for Jugoslavia to be permitted to purchase from the U.S.A. a $3 million (£750,000) steel finishing mill. The purchase will be made from a private American firm.

Strike Violence

Street brawls, smashed windows and overturned motor cars occurred during the strike of members of the United Chemical Workers, CIO, at the plants of the National Carbon Co. Most strikers have returned to work after 77 days and there have been some dismissals.

British Plastics Plant for Australia

Plant and equipment from Great Britain will be used by one of the largest plastics manufacturers in Australia to equip a factory at Adelaide controlled by the South Australian Government. The factory was formerly used as a distillery, and was purchased by the State Government from the Australian Government for £A105,000.

Malaya Development Grant

A free grant of £121,786 from the Colonial Development and Welfare Fund to the Federation of Malaya has been approved by the Secretary of State for the Colonies. A five-year scheme will enable selected young men from small-holding areas to be trained at the experimental station of the Rubber Research Institute.

Commercial Alcohol in Canada

Sales of Commercial Alcohols, Ltd., Montreal, are currently 18 to 20 per cent higher than a year ago shareholders were told at the annual meeting. Mr. C. G. Kertland, president, said that the Gatineau (Quebec) alcohol plant had attained a 60 per cent operating rate, and operation at full capacity was expected by the end of September or October.

Swiss Exports Declining

Switzerland's exports of chemical and pharmaceutical products, dyes and perfumery, amounted to 239.9 million Swiss francs in the first half of the current year, compared with Fr.250.8 million in the corresponding period of last year Export of aniline dyes and indigo fell from Fr.119.9 million to Fr.100.4 million, shipments of industrial chemicals declined Fr.40.6 to Fr.34.3 million, but sales abroad of pharmaceutical products rose from Fr.78.7 to Fr.93.2 million and those of perfumery from Fr.11.6 to Fr.12 million.

Argentina Penalises Shell Mex

A decree requiring Shell Mex of Argentina, a subsidiary of the Shell group, to pay a fine of 1,489,550 pesos was published in Buenos Aires, last week. The fine is imposed for alleged violations of the exchange control regulations of 1938.

Scientific Film Centre in Italy

A centre of scientific cinematography has been established at Polytechnicum in Milan, where the application of films will be studied as an aid to teaching and culture, scientific research, technical documentation, and industrial and architectural research.

Dead Sea Potash Works to Reopen

The potash works at the southern end of the Dead Sea which have been guarded by an Israeli garrison since the end of the British mandate in May last year, were this week handed back to the British owned Palestine Potash Co. The plant is intact, but transport difficulties may delay the resumption of operations.

Crude Oil Output in U.S.A.

A daily average of 4.723 million barrels of crude oil was being produced in the U.S.A. during the week ended August 13 according to the American Petroleum Institute. Daily average output in the previous week was 4.670 million barrels, and 5.507 million barrels in the same week of 1948.

International Pharmacy Conference

The 13th international conference of the Fédération Internationale Pharmaceutique is to be held in Amsterdam from August 28 to September 2. The foundation of this federation was originally due to the initiative taken by the Royal Dutch Society for Promotion of Pharmacology in 1909, and the statutes provide for the secretary and chairman (or vice-chairman) to be Dutch.

Monsanto in Australia

Monsanto Chemicals, Ltd., announces that the name of its Australian associated company has been changed to Monsanto Chemicals (Australia), Ltd. The company, formerly Monsanto (Australia) Pty., Ltd., was converted into a public company at a meeting of shareholders recently held in London. Monsanto Chemicals, Ltd., London, holds the majority of the ordinary stock of the Australian company, and Monsanto Chemical Co., St. Louis, also participates.

Italy Plans Large Supplement of Synthetic Nitrate

Fruitful Use of Low-Grade Sardinian Coal

AN important Italian enterprise, consisting in the further development of the important Sulcis coalfield in Sardinia, the establishment of a large thermo-electric power station, and manufacture of synthetic nitrate, was recently described by Prof. M. G. Levi at a meeting in Rome. (*La Chim. et l'Ind.*, 1949, *31* (7), 242-214.) The author is president of the Azienda Carboni Ital. (A.C.I.), which is mainly concerned in the enterprise through its affiliates.

The extent of the coal resources here is estimated at more than 500 million tons, although it is not of the highest quality. Some account is given of the coal mining and of the important town of Carbonia which has sprung up in the neighbourhood.

Economic Use of Smalls

A special problem in this particular field is the very large amount of " smalls " produced, amounting to at least 50 per cent of the total. It is now proposed that these large quantities of small coal should be gasified by modern methods, with prior recovery of the sulphur content, with a view to the manufacture of synthetics, especially nitrates.

In 1939, Italian output of nitrogen was about 154,000 tons, corresponding to nearly 790,000 tons of fertiliser. Production subsequently declined considerably, but by 1948/49 it had recovered to about 125,000 tons of nitrogen.

The Marshall plan, in respect to Italy, anticipates for 1950/51 and solely for home use a production of 180,000 tons of nitrogen, to be increased in succeeding years. Hydrogen is, of course, also required and is at present produced in Italy mainly from coke-oven gas, an insufficient and not very satisfactory source.

On these and other grounds this new Sardinian scheme is of great national importance, and should have, among others, the following basic features: To be sufficiently large for an output of at least 50,000 tons of nitrogen per annum; be situated near the sea, *e.g.*, at S. Antioco or Porto Vesme; production of hydrogen by gasifying the Sulcis small coal with oxygen and steam; a thermo-electric power plant using the Sulcis smalls.

A Winkler or Koppers plant is proposed for gasifying, together with sulphur recovery. This sulphur could be used for direct conversion into sulphuric acid and ammonium sulphate. It is proposed in the first place to fix two-thirds of the nitrogen as ammonium sulphate and one third as calcium nitrate, as being most in demand, but later, and especially with a view to export, other and more concentrated fertilisers, such as ammonium nitrate and urea, would be manufactured.

For an annual production of 160,000 tons of ammonium sulphate and 110,000 tons of calcium nitrate, about 160 m. kWh would be required (3.25 kWh per kg. of nitrogen), necessitating 115,000 tons of small coal for the power station, 135,000 tons of coal for the gasifiers, 93,000 tons of pyrites, and 66,000 tons of limestone. The total cost is estimated at 18,000 m. lire. About 1500 workmen and 160 chemists, executives, etc., would be employed.

The above figures, such as power and coal requirements, may probably be increased to provide for reserves and other contingencies, including future expansion. Various economic and national considerations are discussed by the author at some length, as having already been placed before the special commission appointed by the Government.

Natural Resources of Canada

UTILISATION of the natural resources of Canada will be discussed in a series of papers to be given at the regional meeting of the American Institute of Chemical Engineers to be held in Montreal from September 6-9.

Conferences of the institute, the largest organisation of chemical engineers in the world, are rarely held outside the U.S.A., and it is 12 years since the last meeting in Canada.

The potentialities and development of water power in Canada will be discussed by Mr. Huet Massue, of the Shawinigan Water and Power Co. Dr. J. R. Donald, of Montreal, will deliver a paper on the Alberta resources in relation to the chemical industry.

" The Economic Significance of Newfoundland as a Province of Canada " will be discussed by Mr. Alvin S. Townshend, and Mr. P. E. Radley will describe the Canadian aluminium industry.

About 400 engineers and executives from all parts of the U.S.A. and Canada will take part.

VEGETABLE OILS OF SOUTH AFRICA

Problems of Cost and Production

AN investigation into tung oil production costs has been ordered by the South African Division of Economics and Markets. It will begin immediately and may result in the introduction of tung oil pressing in the Union. The Eastern Transvaal Highveld, Eastern Natal and Swaziland are the chief producing areas. There are about 300,000 tung trees in South Africa and 175,000 in Swaziland. Total production amounts to about 275,000 tons a year, which is not enough to supply the Union's requirements, so that at present it is necessary to import additional supplies.

* * *

Such a glut of oil nuts is now reported in the Union that an approach has been made to the soap makers to employ some of the surplus in their manufactures. The big price gap between oils and fats derived from groundnuts and sunflower seeds and the customary tallow, whale oil and palm kernel oil has, however, made this impracticable and the Union Government is now faced with the unpleasant alternative of exporting surplus oil from groundnuts to world markets at prices probably far below those outside the Union.

The position in the Union is further complicated by Rhodesian growers. Whereas the guaranteed price for groundnuts to South African farmers is £58 10s. a ton, in Southern Rhodesia the price is £34 a ton. This results in a cost of edible oils to Union expressers of £143 a ton against a cost just across the Limpopo river of about £83 a ton. Since this Rhodesian oil is subject to only 10 per cent customs duty, it follows that, under the present tariff agreement and a guaranteed price arrangement for farmers inside the Union, imported oil from Rhodesia can undersell the local product by no less than £52 a ton. Drought in Southern Rhodesia has so far saved the situation, but a normal crop there could be upsetting for the Union.

* * *

The view that the tsetse fly might be eliminated from the Union by the end of the summer of 1950, provided the Government continued its present support and if farmers in the infected areas would continue to co-operate, was expressed by the Director of Veterinary Services in his presidential address to the annual meeting in Kimberley, of the South African Association for the Advancement of Science.

Phenomenal results had been obtained, he claimed, by the application of DDT and BHC in the 7000 sq. miles of fly-belt in South Africa. Reviewing recent advances in the veterinary and medical fields, he said that much progress had been made in the study of horse sickness, blue-tongue and foot-and-mouth disease. There was a strong suspicion that the foot-and-mouth disease virus was propagated in certain species of game between outbreaks of the disease in cattle. Significant advances had been made with the sulpha drugs in controlling infectious diseases, and new drugs were being evolved for the treatment of malaria in humans.

* * *

United Vermiculite and Base Minerals, Ltd., Victory House, Harrison Street, Johannesburg, is marketing vermiculite under the trade name of Verolite. This concern is mining and producing cleaned and graded vermiculite for export. A percentage of the output is being exfoliated for local use where the demand is expanding.

* * *

Union Liquid Air Co. (Pty.), Ltd., 11-15 Loveday Street Extension, Johannesburg, has been formed with a capital of £250,000 to make oxygen and dissolved acetylene and other compressed gases. The company has acquired a two-acre site in Germiston, where a factory is being erected. It has also taken over a two-acre site in Durban to build a similar factory. The local company is associated with the Canadian Liquid Air Co., of Montreal. A post-war investigation of the local market revealed that the prospects for manufacture were favourable. Oxygen and dissolved acetylene will be the company's two main lines and the calcium carbide for the acetylene will be produced in the Union. At Germiston such medical needs as nitrogen, compressed air and oxygen will be produced. The factories are being fully mechanised and much of the plant and the bulk of the capital is of Canadian origin.

* * *

The specification for salt issued by the S.A. Standards Institution in 1943 has been revised to include many improvements brought to light as a result of prac

(*continued overleaf*)

CHEMICALS IN CEYLON AND INDIA

Export Prospects for Oils

From OUR SPECIAL CORRESPONDENT

VEGETABLE oils all over the world have declined considerably in price and the Government of Ceylon cannot hope to continue getting the prices for coconut oil it received in 1948, according to Mr. V. C. Axworthy, managing director of the British Ceylon Corporation, Colombo. There will definitely be a market for Ceylon coconut oil, he said, but at a limited price. The United Kingdom, he considered, would be prepared to enter into a further contract with Ceylon on the same terms as the existing one, buying at Rs.1021-75 per ton in bulk, FOB, but it was doubtful if this would be continued for a long period.

Increased demands from abroad have resulted in the price of Ceylon citronella oil rising sharply from Rs.2-30 per lb. to Rs.2-65 within the last few days. The average price last year was Rs.1-99 per lb. The 1946 Ceylon citronella oil fetched Rs.5-18 per lb. and in 1947 the average was Rs. 3-17 per lb.

Pakistan's heavy chemical industry, which has been paralysed to a great extent after the establishment of the new Dominion, is rapidly recovering.

The Central Government proposes to install plants for the production of one ton daily of sulphuric acid at Chittagong, the West Punjab, Karachi and the North West Frontier Province. These four plants are expected to be in operation by the end of 1950, and would produce about 1500 tons of pure acid required for industries.

In addition, the Government has approved the setting up of three "contact" plants in Western Pakistan, which will be in operation by the end of this year. The question of setting up a similar contact plant in East Pakistan is also under consideration by the Government.

With the establishment of sulphuric acid and synthetic ammonia plants, the manufacture of nitric acid is expected to present no difficulty. Requirements of hydrochloric acid would be met as a by-product in the process of manufacturing electrolytic caustic soda.

A plant to produce 70 tons of soda ash daily is working in Western Pakistan, as against the annual requirement of 12,000 tons. The Government of Pakistan will authorise the export of 8000 tons of soda ash to foreign countries.

Mr. B. S. Lalkaka, chairman of the Indian Chemical Manufacturers' Association of Bombay, referred to the various difficulties, which the spirituous products industry had to face and the several restrictions imposed by the Government of Bombay on their sale and transport.

He deplored the unhelpful attitude of the Government towards the development of the industry. India, he added, possessed nearly 75 per cent of the world's barks, herbs, gums and roots, which offered excellent scope for developing spirituous products and perfumery.

VEGETABLE OILS IN SOUTH AFRICA

(*continued from previous page*)

tical experience, particularly in regard to the presence of trace elements in table and dairy salts and the effect of impurities in salt used for curing hides and skins. The revised edition of the specification which has been published on behalf of the S.A. Standards Institution by the Standards Council has been declared a S.A. Standard Specification.

The specification classifies salt according to its uses into three main groups, broadly, for industrial use; as a foodstuff; and as a preservative. The committee responsible for drawing up the specification considered that the salt industry in the Union could derive great benefit from standardisation and its application to quality. Copies of the specification, No. SABS 12-1948 are obtainable at 5s. each, post free, from S.A. Bureau of Standards, Pretoria.

* * *

While benzol is produced in the Union, mainly by the S.A. Iron and Steel Industrial Corporation, Ltd., supplies are not sufficient to meet all local requirements. Thus there has been no objection to the application by Klipfontein Organic Products for an extension of the rebates of customs duty on benzol to make benzene-hexachloride concentrate, which is now produced locally on a large scale.

GERMAN IRON AND STEEL

Survey of Wartime Developments

FOR some time the iron and steel industries of the United Kingdom and the U.S.A. have been pressing for a detailed and comprehensive work of reference on development and progress in German ferrous metallurgy during the war years, when all international exchange of scientific and technical knowledge was suspended. This need, says a Board of Trade note this week, is now being met by the publication today of the BIOS Overall Report No. 15: "The Ferrous Metal Industry in Germany During the Period 1939-1945" by Geo. Patchin, formerly principal of the Sir John Cass Technical Institute, London, and Ernest Brewin, intelligence officer of the British Iron and Steel Federation.

The German iron and steel plants were inspected between November 1944, and May 1947 by some 120 teams of British and American experts, each team issuing its own specialised report. In all, over 400 reports have been published by HMSO, and an imposing mass of foreign language documents has been accumulated in this country.

Pre-War Comparison

In this volume the large number of reports are correlated and condensed, to afford an exhaustive summary of the devlopments in the industry, surveyed from all angles. The volume is in nine sections: Blast furnace plant and practice; Steelworks plant and practice; Mechanical treatment; Foundry practice; Steels, ferro-alloys, hard metals; Heat treatment; Cutting; Joining, repairing, fastening; Coatings (including cladding and bonding); Research and testing. Critical analysis and comparisons of pre-war and wartime practice are given, deviations from British and American practice, with their resulting advantages or disadvantages, are stressed; trends, induced by material shortages or by availability of new alternative materials or processes, are recorded; and the possibility of future application of wartime innovations is discussed. A section on research shows the close link between German investigators and the industries concerned and surveys the iron and steel research centres, reviewing their specialised work. An appendix to each section gives full reference to the original reports surveyed and there is a comprehensive index. The volume of 270 pages, costs 4s. 6d.

INSTITUTE OF METALS

Autumn Meeting in Paris

THE first meeting of the Institute of Metals to be held outside the British Isles since 1936 will be the 41st annual autumn meeting, which will be held in Paris and the surrounding neighbourhood from Monday, October 3, to Wednesday, October 12.

This has been made possible by the invitation of the Société Française de Metallurgie and the French Non-Ferrous Metal Industries, and members will be welcomed by an influential reception committee with M. le Géneral Nicolan, président de la Société Française de Métallurgie, chairman, and M. Eugène Dupay, honorary secretary.

At the same time, and in the same building, the annual meeting of the Société Française de Métallurgie will be held, and these two conferences will provide excellent opportunities for French, British and other members to meet. Care will be taken that the non-ferrous sessions of both societies do not clash. The meeting of the Société Française de Métallurgie will open at 10 a.m. on Monday, October 3, when Dr. R. Seligman will deliver an address in French. Members of the Institute are invited to be present.

The Institute meeting will be in two parts, the first taking place in Paris from Monday, October 3, to Saturday, October 8, and the second from Sunday, October 9, consisting of tours outside the Paris area.

Among the interesting papers are: "Recent French Work in the Field of Light Alloys," by Prof. Georges Chaudron; "Some Effects of Silicon on the Tendency to Cracking in Aluminium-Copper-Magnesium Alloys of High Purity," by W. I. Pumphrey and D. C. Moore; "Segregation and Liquidation in Alloys and their Application to Non-Ferrous Metallurgy," by A. M. Portevin and M. Dannemuller.

The programme also includes an informal conversazione in the Maison de la Chimie, banquet at the Cercle Interallié, and visits to the laboratories of the Centre National de la Recherche Scientifique, Bellevue; Centre Technique de l'Aluminium, and attendance at the Osmond Centenary ceremony at the Sorbonne, at which the President of the Republic will be present.

Coke Output in Canada

Production of coke in Canada from ovens and gas retorts in May totalled 348,000 tons compared with 336,000 tons in April, and 327,000 tons in May, 1948.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgage Satisfactions

HOWARD-PRICE, LTD., Lincoln. (M.S., 27/8/49.) Distillers of tar, etc. Satisfaction July 20, of debentures registered March 26, 1936.

KENT CHEMICAL CO., LTD., Tenterden. (M.S., 27/8/49.) Satisfaction July 14, of charge registered Oct. 6, 1945.

RICHARD THOMAS & BALDWINS, LTD. (formerly RICHARD THOMAS & CO., LTD.), London, W. (M.S., 27/8/49.) Steel tinplate, etc., Manufacturers. Satisfaction July 22, of debenture stock registered July 19, 1937, to the extent of £335,816.

Company News

Bush, Beach & Gent, Ltd.

At an extraordinary general meeting at which it was agreed to increase the capital from £20,000 to £50,000 it was announced that a bonus issue of 10,000 fully-paid £1 ordinary shares and 10,000 fully-paid £1 5 per cent non-cumulative preference shares would be made. One ordinary and one £1 preference share will be allotted in respect of each £1 ordinary share held at June 30, 1949.

C. & E. Morton, Ltd.

The 37th annual report for the year ending March 31, 1949. Net profits £92,179 (£120,588). Dividend on 7 per cent preference £15,400 (same); ordinary (interim 25 per cent), £61,875 (£94,050).

Standard Oil (New Jersey) Affiliates

Consolidated earnings of the company's affiliates for the six months ended June 30, 1949, after all charges, are estimated to be $137.1 million ($210 million) or $4.54 per share ($7.5) on 30,183,394 shares outstanding on that date. The earnings reflect both reduced operating rates and lower average prices.

Veno Drug Co., Ltd.

Twenty-fourth annual report, for the year ended March 31, 1949. Net profit £160,612 (£161,651). Dividend on 8 per cent preference £13,200 (same); 12 per cent preferred ordinary £18,150 (same); deferred ordinary (1s. per share) £107,250 (same).

New Registrations

Plant Productivity, Ltd.

Private company. (471,643). Capital £1000. Agricultural research workers, industrial chemists, chemical research specialists. Directors: R. F. Milton, and W. A. Stephenson. Reg. office: 24 Welbeck Way, W.1.

Private company. (471,958). Capital £50,000. Objects: To acquire the business of paint manufacturers carried on by G. Wadsworth & Son, Ltd., at Beddington Lane, West Croydon. Directors: G. Wadsworth and J. Wadsworth. Reg. office: 47 Victoria Street, S.W.1.

Private company. (471,833). Capital £7500. Objects: To acquire the business of manufacturers of detergents and other similar products carried on by H. A. Tappin and B. E. Tappin. Directors: H. A. Tappin, B. E. Tappin and E. Poole. Reg. office: 22a Green Lane, Penge, S.E.20.

Increases of Capital

The following increases in capital have been announced. THE LONDON FUMIGATION CO., LTD., from £1000 to £20,000. SIDNEY R. LITTLEJOHN & CO., LTD., from £10,000 to £35,000.

Partnership

Dr. R. F. Paget and his chemical and engineering associates, of Barwick in Elmet, Leeds, have established a partnership to facilitate the wider operation of their service as chemical engineering consultants and suppliers of specialised chemical plant.

Rayon Plant for Australia

REPORTS from Australia state that Courtaulds will probably announce in London shortly its project to establish a large rayon factory at Tomago Sands, near Newcastle, N.S.W. It is expected to cost about £5 million.

A senior representative of Courtaulds has been in Australia for some weeks working on plans for a 900-acre site. Difficulties of water supply are now said to have been overcome and the arrangement of facilities has been the subject of lengthy negotiations between Courtaulds and the Federal and State Governments. The plant is expected to employ about 4000.

Chemical and Allied Stocks and Shares

STOCK markets have continued to mark time, awaiting the outcome of the Washington financial talks. British Funds, however, have been firmer, apparently because of the growing belief that in any case Sir Stafford Cripps will not agree to devaluation of sterling. Industrial shares have also shown a firmer trend, although in most cases price movements were small.

Among shares of chemical and kindred companies, Borax Consolidated deferred were good, up to 53s., being in favour because of the company's important assets and earnings in the U.S.A. Imperial Chemical have been steady around 41s. 9d., Dunlop Rubber firmed up to 61s. 3d., and Lever N.V. to 44s. British Oxygen have been more active around 93s., British Aluminium 42s. 9d., and Turner & Newall 74s. 9d.

Shares of metal dealing companies were more in evidence, partly because it is believed that, in the event of devaluation of sterling, re-opening of the London Metal Exchange would quickly follow. Amalgamated Metal shares firmed up to 18s. and Metal Traders rose to 46s. 3d., although the advance in the latter was attributed to expectation of the results creating a good impression and to talk of a share bonus.

Laporte Chemicals 5s. ordinary were 20s. 9d., Boake Roberts at 28s. 9d. were unaffected by the full financial results, and Brotherton 10s. shares were 19s. 6d. Albright & Wilson eased to 27s. 3d., Amber Chemical 2s. shares were 4s., F. W. Berk 2s. 6. ordinary were 12s. 6d., and Bowman Chemical 4s. shares 6s. 9d. Monsanto Chemicals have changed hands around 49s. 9d. Among preference shares, British Chemical & Biologicals 4 per cents were 20s., W. J. Bush 5 per cents 24s., and L. B. Holliday 4½ per cents 20s. 6d.

Shares connected with plastics showed small irregular movements, De La Rue easing to 25s. 6d. British Industrial Plastics 2s. shares were 4s. 9d., Erinoid strengthened to 6s., and British Xylonite were 66s. 3d. The 4s. units of the Distillers Company rose to 25s. 9d. on the full results and accounts. Ilford have further improved to 23s., General Refractories were 22s. 9d., United Molasses were already at 37s. 9d., and British Glues 4s. shares were firm at 19s. on market talk of share bonus possibilities.

Iron and steels remained very quiet, with those on the nationalisation list well below their official take-over levels. Dorman Long were 28s. 6d., United Steel 25s. 10½d., Stewarts & Lloyds 52s. 10½d., and Colvilles 31s. 10½d. Staveley have firmed up to 78s., awaiting the financial results, and Powell Duffryn have further improved to 27s. 3d. on hopes that the forthcoming dividend will be maintained.

Boots Drug showed steadiness at 48s. 6d. and Beechams deferred improved to 12s. 9d. Glaxo Laboratories were firm at £18¼. Oils lost a little ground, Shells easing to 68s. 9d., and Anglo-Iranian to £7 3/16. Trinidad Leaseholds were 23s. 9d. and Burmah Oil 58s. 9d.

CANADIAN PHOSPHATES

PHOSPHATE rock formations at Buckingham, in the Hull district of Quebec, after having been left abandoned for about 60 years, are now undergoing a promising period of revival as a result of the Quebec Smelting and Refining, Ltd., developing its extensive properties in that section of the province.

By far the greater part of Canada's annual phosphate requirements of approximately 300,000 tons now is imported from the U.S.A. and the company is reported to have set its Buckingham development objective at turning out between 30 and 40 per cent of Canada's entire phosphate needs in the future.

The Quebec Smelting and Refining, Ltd., interests have already carried out 26 drillings on their holdings so far this season. The ensuing assays have given returns ranging from 25 to 95 per cent, with the overall average about 35 per cent for all of the various analysis made.

The company is expected to have a pilot mill, with a daily capacity of approximately 25 tons, in operation some time this autumn. Its eventual daily production basis is said to have been established at 1000 tons, and with this end in view, the outlining of 1 million tons of phosphate rock of commercial grade is planned. The recovery of the actual usable rock, on this basis, is likely to be slightly more than 300 tons a day.

The mining of phosphate ore in the region of Buckingham begun on a moderate scale late in the last century, but was eventually abandoned around 1890, apparently because of the poor market conditions for the Canadian product. It is expected that the company will, initially, use a new type of concentrator and then treat the tailings by the flotation process.

Prices of British Chemical Products

Further Fluctuation in Lead Chemical Values

DURING the past week slightly more active trading conditions have been apparent on the industrial chemicals market and a fair amount of new business has been reported. Among the soda products, bicarbonate of soda, soda ash and caustic soda are all in good request and the potash chemicals continue firm at unchanged rates. Miscellaneous items in steady demand include the barium compounds, liquid chlorine, formaldehyde and hydrogen peroxide. Rather sluggish conditions persist on the coal tar products market, buying on home trade account being only of moderate extent.

MANCHESTER.—Holidays in Lancashire and West Riding industrial centres are still affecting business on the Manchester chemical market, although the next few weeks should see a return to normal conditions in this respect. On the whole, a fair amount of new inquiry for a wide range of light and heavy chemical products has been reported during the past week and reasonably steady deliveries to the soap, textile and other leading industrial outlets are being made. Relatively little change in the price position compared with a week ago has occurred. General buying of superphosphates and other fertiliser materials is broadening somewhat after the seasonal lull. In most sections of the tar products market rather dull trading conditions are still reported.

GLASGOW.—The Scottish chemical market has been much more active during the past week, although the demand for chemicals from paper manufacturers is on a reduced scale. Delivery of carbon tetrachloride has not been so good but it is understood that this will return to normal in the course of a week or two.

Price Changes

Rises: Lead carbonate, lead nitrate, red lead, white lead, litharge, zinc oxide.

Reductions: Borax, lead acetate, cresylic acid.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.— Ton lots, d/d, £101 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder. Spot, 35/37%, £11 to £11 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £46; in 1-cwt. bags, commercial, granulated, £27; powdered, £30; extra fine powder, £31; B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £48; crystals, £53; powdered, £51-£53; extra fine powder, £53. B.P., crystals, £61; powder, £62; extra fine, £64.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. 7½d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 9d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 7d. per lb.

Copper Sulphate.—£36 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107, per ton.

Lead Carbonate.—British dry, ton lots, d/d, £115 10s.

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £94.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £105 10s.; orange lead, £117 10s. Ground in oil: red, £129 5s. orange, £141 5s. Ready-mixed lead paint: red, lots of 20 gals. and under 160 gals. in 1 gal. tins uncrated, £2 5s. per gal.; orange 3s. 6d. per gal. extra over the price for red.

Lead, White.—Dry English, in 8-cwt. casks, £115 10s. per ton. Ground in oil, English, under two tons, £135 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£103 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic.—Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

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Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £66.; green seal, £65; red seal, £63. 10s.

Zinc Sulphate.—£31 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached. £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in September, £9 19s., rising by 1s. 6d., per ton per month to March 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 8s. 6d., rising by 2s. 6d. per ton per month to June, 1950. National No. 2 raised from £10 8s. 6d. to £10 18s. per ton, due to increase in potash content, as notified in new Board of Trade Order.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 21s. 6d. to 22s. 6d. per gal.; 90/160°, 19s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—August 24. The prices of all unrefined oils and fats and technical animal fats remain unchanged until September 3. (THE CHEMICAL AGE, *61*, 172.) There is no change in the prices of refined oils until September 10.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Standardising Scientific Terms

WHILE many of the proposals recently adopted for the standardisation of symbols, units and nomenclature merely codify existing procedure, some important changes are also gaining acceptance and it will be incumbent on industrial chemists and chemical engineers to become familiar with them.

In a recent review of the position in *Nature 164*, No. 4163, p. 263) Sir Charles Darwin, F.R.S., draws attention to the more important results of the post-war discussions of the International Unions of Chemistry and of Physics. The joule has been adopted as the unit of heat in place of the calorie. In the measurement of heat, says Sir Charles, water is now unimportant and unsatisfactory as a basis and the measurement of heat is now usually done electrically. This is by no means an academic matter, as researchers will be required to give results in joules; gradually all the reference books on which the industrial worker relies will give their thermal data in these units. Meanwhile, an essential part of the transformation must be the preparation of conversion tables " together with a critical review of the matter, since many workers are quite unaware what a vague expression the calorie really is."

Just how far-reaching this matter is, is evidenced by the fact that in an average selection of reference books examined from this point of view it was found that the calorie is used almost exclusively for thermal data. Thus Perry,[1] Bayley,[2] Handbook of Chemistry,[3] Landolt-Börnstein,[4] Kaye & Laby,[5] in their latest editions, and even the very recent edition of Lowry & Sugden[6] all employ calorie as the unit. Furthermore, the Handbook of Chemistry[3] gives conversion factors for joule to calorie to five figures—extraordinary precision for a " vague expression." Even current issues of J.C.S. and Proceedings of the Royal Society continue to use the " outmoded unit," the calorie. Only International Critical Tables[7] give most of their thermal data in joules and kilojoules. Chemists and chemical engineers use thermal data—heats of formation, combustion, latent heats and specific heats, etc.—so extensively that publishers and authors alike will have to take careful note of these new decisions. Other decisions, although important in themselves, will not have such widespread effects.

Increasing work in radioactivity has accentuated the confusion in units and the dissatisfaction to which the lack of uniformity gives rise. The curie was

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originally the quantity of radon in equilibrium with a gram of radium. Its meaning has gradually been transformed, so that it has come to be used as a measure of the number of disintegrations per second. As a temporary measure the "international curie" is to signify 3.6 by 10^{10} disintegrations a second, but there are proposals afoot for the use of the rutherford. The diminished importance of radium, which is suggested by this decision, is confirmed by the news that a joint committee of the two International Unions will supersede the International Commission on Radium Standards.

One of the differences in nomenclature will bring the United Kingdom into line with Continental practice. This is the use of the name Celsius for the temperature scale which we now call Centigrade, and is intended to avoid confusion with the French and German meanings of this word. The International Union of Physics recommended that there should be only one fixed point on the absolute scale instead of the present two, and that this point should be the triple point of water, suitably chosen so as not to alter the existing scale. The Symbols Committee of the Royal Society, furthermore, has recommended that there should be confirmation of British practice in the definition of the "atmosphere" for those engaged on vacuum or pressure work. They urge that it should remain 76 cms. of mercury at 0° C. and with $g = 980.665$ cm./sec.^{2}, despite the challenge of the use of 1000 millibars (the "bar") and the Continental "technical atmosphere" of 1 kgm./cm.^{2} These and some other changes and moves to international standardisation should be seen as part of a great pattern of advance—aiding the development of science, technology, and ultimately of trade.

In the purely mechanical field, similar advances have recently been reported by the International Organisation for Standardisation. Far from leading to a levelling down and a drab monotony, they make possible a far richer equipment by eliminating variety where this is not necessary. It may add to the complexities, but it certainly does not add to the richness of life when British and Continental chemists have to study to discover what is meant when they collectively discuss measurements—and then have to

(*continued on page* 308)

Notes and Comments

Dollar Chemicals

THE small reduction in July in the value of United Kingdom chemical trading with other countries reflected a trend not peculiar to this country. The U.S.A., largest of the world's suppliers of chemicals, shared almost proportionately the results of the contraction of buying in some of the principal markets. That is one of the salient facts of the half-yearly statement just issued by the U.S. Department of Commerce, which also discloses that chemical export sales of America in six months this year represented the vast turnover of $450,432,000. This record figure comprised sales to the value of $226,432,000 in the first quarter and the diminished total of $224 million in April-June. It is being recognised in the U.S.A. that slackening in trade in the second three months suggested by the dollar totals is not necessarily a complete explanation, since in that period there has been a fairly widespread reduction in individual chemical values. The same argument is, of course, equally applicable to the recent fall in United Kingdom chemical export values. The aspect of the American result, less easy to explain except partially as an effect of Marshall Aid, is how such active trading has been maintained at a time when nearly all the world is short of dollars.

Sir John Simonsen

THE growing readiness to recognise some of the debt owing to chemists who have rendered much of their service outside the orbit of metropolitan affairs is one of the incidental effects of the new awareness of the importance of Colonial economics. The American Chemical Society has furthered that general principle in deciding that Sir John L. Simonsen, F.R.S., should be the first recipient of the American Fritzshe award (with £1000), instituted to "recognise and encourage outstanding achievement in analysis, research, and new applications of essential oils, essential oil isolates and related chemicals." Sir John, director of the Colonial Products Research Council of the Colonial Office for the past six years, made the first isolation of carvene hydrocarbons from Indian oils, and of the sesquiterpene ketones from Australian oils. He also discovered a number of new essential oil constituents (including thujene and di-piperitone). The second edition of his treatise "The Terpenes" is appearing in three volumes; the first was published in 1947, the second has been delivered to the printers, and the third is due next year. Sir John is deeply concerned with the application of existing knowledge and maintains that the Colonies offer great opportunities for this. He does not disguise, however, that such application will depend to a large extent on the widening of the education of the Colonial peoples, at present hampered by the shortage of foremen, trade schools and technical schools. Sugar, starch and the vegetable oils are among the potent raw materials of the Colonies, regarded by Sir John as the potential basis of a large chemical industry within a decade.

Scientific Copyright

AN important sequel to the scientific information conference organised by the Royal Society last year is the declaration published recently by the council of the society stating that it will regard certain copying from its own publications as "fair dealing," and inviting other societies and publishers to subscribe to a similar document. The problems of the library or information service have been considerably complicated with the advent of cheap photo-copying processes by the necessity of obtaining individual permission from the copyright holder whenever a photo-copy was made. While refusal of such permission seldom occurred, many agencies in this country were bound by the letter of the law and would not undertake to supply photostats or other photographic copies of papers to individual scientists without obtaining the holder's consent. In making this declaration the Royal Society is, therefore, setting an example which it is hoped will be followed by all those concerned with the publication of scientific periodicals in which original papers appear. The declaration states: "We will regard it as fair dealing for the purpose of private study or research when a non-profit making organisation, such as a library, archives, office, museum or information service, owning or handling scientific or technical periodicals published by us, makes, and delivers a *single* reproduction of a part of an issue thereof to a person or his agent, representing in writing that he desires such reproduction in lieu of a loan or manual transcription and that he requires it solely for the purpose of private study, research, criticism or review, and that he undertakes not to sell or reproduce for publication the copy supplied, provided (1) The recipient of the copy is given notice that he is liable for infringement of copyright by misuse of the copy and that it is illegal to use the copy for any further reproduction; (2) the organisation making and furnishing the copy does so without profit to itself; (3) proper acknowledgement is given to the publication from which the copy is made; (4) not more than one copy of any one excerpt shall be furnished to any one person." The declaration has been made for an experimental period of two years, and so far more than seventy publishing bodies have subscribed to it.

Popular Exposition

ROYAL Society policy represents a specialised and more obviously important aspect of the aim being furthered by the 111th meeting of the British Association in Newcastle this week, and one in which UNESCO is taking a lively interest in its wider field. The international body believes it is its duty to make scientific knowledge more available to everyone. In short, the popularisation of science, which in fact requires no popularising, but only wider exposition in a form which is intelligible and does not misrepresent the true objectives. That project is perhaps more urgent than it may appear to those who observe that science in the past has never found itself retarded because of lack of popular understanding. Lavoisier's audience in the entire world was probably fewer than those comprising one university chemistry department in 1949. It seems to be agreed today that science, disposing of considerably more public funds than ever before and with a much more intimate relationship with individuals, is everybody's business. Sir Richard Gregory has lately taken the lead in appealing for the collaboration of science writers with UNESCO. Many in his view, are now qualified for the rôle of popular expositor, but the scope offered by the paper-starved general Press does not offer much encouragement.

STANDARDISING SCIENTIFIC TERMS

(*continued from page* 306)

engage in laborious, time-wasting conversion calculations.

Standardisation of units and nomenclatures will also help in achieving greater quantity and variety of products. As one of the first steps towards this desirable state it will devolve upon all who are concerned with scientific and technological publication to introduce the new units and to adhere to them.

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[5] "Physical and Chemical Constants," by Kaye and Laby, Longmans Green, 9th Edn., 1941.

[6] Lowry and Sugden, "Physical Chemistry," Macmillan, 2nd Edn., 1949.

[7] "International Critical Tables," McGraw-Hill.

U.S. CHEMICAL EXPORTS

New High Record Total

THE value of exports of chemicals and allied products from the U.S.A. in the first six months of 1949 reached a new high level, totalling $450,432,000, suggesting that the year's total may constitute a new record of $900 million. Exports in the first quarter were valued at $226,432,000 and in the second quarter declined slightly to $224 million. This was probably due to generally lower prices for chemicals and not to a decrease in physical volume. The first quarter total was exceeded only by the $238,557,000 exported in the same quarter of 1947, and included:—

Coal-tar products	$28,797,000
Chemical specialities	$42,916,000
Industrial chemicals	$35,778,000
Paints, pigments, and varnishes	$22,156,000
Fertilisers	$22,855,000
Explosives	$2,508.000
Naval stores, gums and resins	$7,985,000
Linseed, essential and aromatic oils	$2,918,000
Dyestuffs and tanning extracts	$213.000
Sulphur	$7,638.000

Coal-tar products and industrial chemicals in the January to March period showed large increases over the previous quarter. Exports of chemical specialities were down slightly from the record total of the second quarter of 1948. Industrial chemicals, which reached a record of $45,089,000 in the third quarter of 1947 and dropped steadily thereafter, reversed this trend in the first quarter of 1949.

Europe maintained its lead as the best market for American chemicals, buying $66 million worth in the first quarter. North America bought 26 per cent of the total, and Asiatic countries almost equalled that percentage. South American countries retained fourth place.

Canada imported $29 million worth or 13 per cent of U.S. total chemical exports in the first quarter. Mexico was the second best customer, Cuba the third, and the Dutch West Indies fourth.

Among countries in Asia and the Far East, the Philippines took the lead as America's best customer, followed by Japan which ran a close second India, which had been the best buyer in 1948, dropped to third place, probably as a result of that Government's strict import licensing.

UNIFIED SCREW THEAD

The International Programme

REVIEWING the recent three-day Paris meeting of the International Standardisation Organisation, the American Society of Mechanical Engineers reports that a favourable start towards unification of the various national standards on screw threads was made. Delegates from 15 of the 18 countries agreed to recommend the recently established unified Anglo-American screw thread to their national standardising bodies as the common profile for the metric and inch systems of screw threads.

Participating Countries

Sweden acted as secretariat for the participating countries. They were Great Britain, U.S.A., France, Russia, Poland, Belgium, Canada, Denmark, Finland, Portugal, Hungary, Israel, The Netherlands, Norway, Switzerland, Czechoslovakia, and Italy.

Russian delegates, casting the only negative vote, had come to the meeting instructed to support the Zurich 1939 profile, somewhat similar to the unified Anglo-American screw thread. Czechoslovakia abstained from voting, while Italy agreed to recommend the Anglo-American thread for the inch system of screw threads only.

The vote on the Anglo-American thread was one of five resolutions adopted.

A sub-committee was established to define the scope of the Technical Committee, known as ISO-T1. It was decided that the unified Anglo-American screw thread would be referred to as the " ISO Basic Profile."

The programme of work for the Technical Committee will be concerned with threads for bolts and nuts with triangular profile smaller than 6 mm. diameter; 6 mm. diameter and larger; and constructional threads with triangular profile 6 mm. diameter and larger. In each case the committee will be concerned with profile, diameter, pitch series, and preferred diameters and pitches. It will also deal with threads with profile other than triangular.

The scope of the Technical Committee was defined as: " the establishment of a series of internationally interchangeable screw threads covering the technical requirements in various fields of application with a minimum variety of basic profiles, pitches and diameters. The unification of American and British pipe threads is not included in this scope."

PALESTINE OIL AND POTASH

Conflicting Accounts of Development Prospects

REPORTS that the Israeli Government had issued, in one case, an ultimatum, and in another, a warning of nationalisation to industries which have been at a standstill for about 15 months were denied last week.

The staff at the Haifa oil refineries, owned by Consolidated Refineries, Ltd., stated that no ultimatum to the effect that the plant should be reopened within four months had been received from the Israeli Government. The British staff was unwilling to act on its own initiative to operate the refineries or hand them over to other staff. Decision would have to come from the London offices and the British Government The refineries have an annual capacity of about 4 million tons of finished product.

Official Reassurance

The second statement was by the Israeli Government, asserting that there was no truth in the report that it intended to expropriate and nationalise the Sdom potash works at the southern end of the Dead Sea. The Government is said, however, to have advised the British-owned Palestine Potash Company, in view of the inadequacy of its resources, to participate with financially powerful groups, probably American, interested in the large-scale exploitation of the Dead Sea's mineral wealth.

A ministerial committee which recently investigated the mineral prospects of the Dead Sea has accused the Palestine Potash Company of "neglecting adequately to exploit the country's greatest source of mineral wealth." The sea is said to contain magnesium chlorides and other minerals, still commercially unexploited.

Charges Denied

Evidence suggesting that the recent critical statement about Palestine-Potash, Ltd., did less than justice to the company is contained in a letter to *The Times* (August 27) by the managing director of the company, Mr. M. Novomeysky.

He deals with the reported dissatisfaction of the Israeli Government with the company's reputedly small output, that it had extracted "only 100,000 tons of potash since the work began in 1930 and an infinitesimal quantity of bromide" and that other minerals had been neglected.

"The actual figures," writes Mr. Novomeysky, "are as follows:—Potash produced up to the end of 1947, 1,040,000 tons; bromine produced up to the end of 1947, 8200 tons. Latterly exports of bromine have been reduced owing to high freight charges and increased production in the United Kingdom.

"It is correct that the Dead Sea contains unlimited quantities of magnesium chloride, but several efforts to start production of magnesium metal before the war had to be postponed in view of the very small world consumption. From 1935 to 1938 an average of only 2000 tons was produced in the United Kingdom, and 4800 tons was the American production in 1939.

"Large-scale production of magnesium metal began only during the war. At the outbreak of the war the company was in negotiation with the Air Ministry and the Ministry of Aircraft Production for erecting a plant on the Dead Sea, and negotiations had reached an advanced stage early in 1940. The Government expressed their interest in the company's proposal, and were prepared to bear the cost of the plant. Italy's entrance into the war, however, which resulted in closing the Mediterranean, brought negotiations to a standstill.

Seeking New Finance

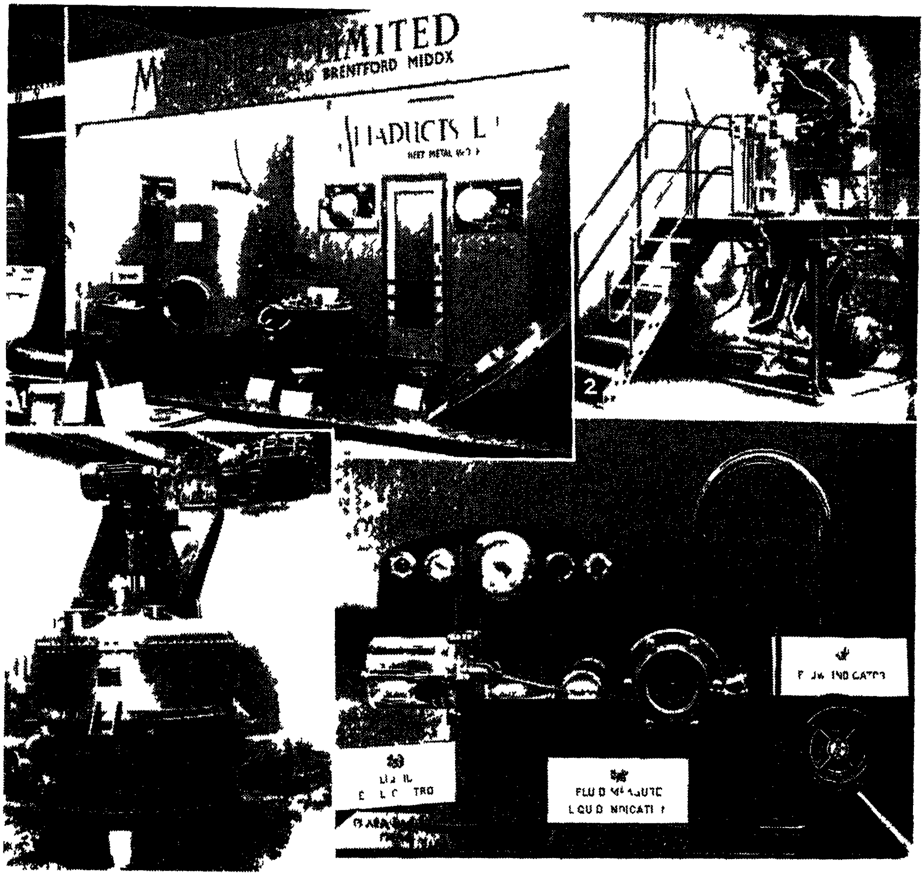
"It is well known that after the war production of magnesium reached such a stage that many of the plants here and in the United States had to close down. Full details were given in a White Paper issued in 1944. Those who have followed closely the company's activities have often expressed their appreciation of the progress achieved notwithstanding the adverse conditions in Palestine since the 1936-38 disturbances, followed by the difficult war years and the unsettlement since.

"It is correct that with the authority of my board I am in negotiation in the United States as well as in this country for financing jointly the resumption of work on the Dead Sea on a larger scale."

S. Rhodesia Exploiting Kaolin

Large deposits of kaolin, occurring within 20 miles of Salisbury, are now being opened up and will be used, at first, for the local manufacture of fire-proof ceiling board.

Chemical Plant at Olympia



Representative of the increased representation of chemical processing plant are these examples seen this week at the Engineering and Marine Exhibition at Olympia London W 1 1 The Metaducts exhibit reflects principally the current interest in large stainless steel processing vessels for chemicals oils and foodstuffs. 2 Combined melting and mixing plant in jacketed stainless steel showing advanced use of power and steam applications (Thompson Bros (Bilston) Ltd). 3 A 500 gallon jacketed still lined with stainless steel and fitted with power turbine impellor (Thompson Bros (Bilston), Ltd) 4 Part of the display of fluid measure and liquid level control by Bayham, Ltd 5 The wide usefulness of silicone materials, as gaskets and lubricants, impervious to temperature change illustrated on the stand of Albright and Wilson, Ltd

Growing Capacity of French Industries

Monnet Plan Favours Chemicals and Metals

GOOD progress has been made under the Monnet Plan in some sections of the French chemical industry. Some evidence of this is contained in the recently issued fourth half-yearly official report, to December 1948.

Among outstanding achievements in this progress are: new electrolytic plant at Pont-de-Claix (Isère), securing power economy of about 20 per cent; increased capacity of sulphuric acid plants, especially by the contact process and including reconstruction of the Granville works using the new Katchkaroff method (H_2SO_4 and HNO_3); four new plants for carbon disulphide; modernising of superphosphate works, including a new one at Rouen; improved equipment of potash mines; increased production of antibiotics at Vitry—streptomycin is being produced this year; increased manufacture of plastics, and the extension of the works at Montluçon for making vinyl chloride; and establishment at Saint-Auban (Basses-Alpes) of a technical centre.

The total nitrogen needs of France and of French overseas territories for 1952/3 have been estimated at 450,000 tons, towards which home-manufacture will will afford 350,000 tons. It is considered that, taking into account present plant efficiency and losses in conversion to finished fertilisers, total capacity in 1952/3 should be between 465,000 and 540,000 tons.

Since the beginning of 1947 annual capacity increase has been about 24,000 tons.

The total cost of extensions of coke and gas plant in 1948 was rather more than Fr. 6000 million. Output of metallurgical coke by 1952 should be 10.2 million tons, as compared with 7.6 million tons in 1938. New installations include 443 new coke ovens at the mines and 304 metallurgical coke plants with total capacity of nearly 1000 tons per day and several new gas works, with piped supply.

Important research work is being undertaken in the gas industry, especially in connection with the coking of Lorraine coals, at Thionville, Carling and Marienau. These coals hitherto have been used only to the extent of about 50 per cent, mixed with other better quality coking coals. It is hoped now to raise the lower grade proportion to 80/85 per cent.

In the cement industry the pre-war capacity of 8 million tons—which was not fully utilised—is thought sufficient for the near future. Attempts are being made to increase efficiency and fuel economy, there is to be general modernisation and the manufacture of slag cements is to be increased. Total expenditure for development in 1948 was Fr. 2200 million, compared with Fr. 600 million in 1947. This expenditure included Fr. 190 million for imported plant, mostly from the U.S.A.

In the department of non-ferrous metals, the electrolyte zinc works of Viviez (Aveyron) has been enlarged, while the thermal zinc works of Auby (Nord) have not yet progressed much beyond the preparatory stage. The same applies to some of the aluminium works extensions. On the other hand, increased production of ferro-chrome has enabled imports to be reduced. (*Chim. and Ind.*, 1949, 62 (7), 82-83.)

REFRESHER COURSE

APPRECIATING the importance of works and plant engineers as key men in every industrial development and the consequent need that they should be fully abreast of current technology, Incorporated Plant Engineers has inaugurated in its South Western region a refresher course for these essential personnel. It will comprise 26 addresses by specialists in each field drawn from industry in different parts of the country. There is to be one 2-hour evening session each week, one hour for the address and the second hour devoted to intensive discussion.

The syllabus covers the following subjects: Combustion and steam raising; steam utilisation; distribution and utilisation of electricity; mechanical transmission of power; lubrication; refrigeration plant; compressed air plant; pumping plant; instrumentation of plant; planned maintenance. Meetings will be at the Bristol College of Technology in collaboration with the University of Bristol. Although the course is intended primarily for works and plant engineers in the South Western region, it will be open to engineers and students from any region. The secretary to the course is at 12-14, Apsley Road, Clifton, Bristol, 8.

The Study of Reaction Kinetics

Light on the Nature of Chemical Change

by Sir ALFRED EGERTON, F.R.I.C., F.R.S.*

THE study of slow oxidation and ignition has in recent years provided a most prolific field of inquiry, which has enriched chemistry by the kinetic approach in distinction to the thermodynamical approach of the latter part of the last century.

Such studies have had their repercussions in other directions; for instance, in the chemistry of polymers, the building of large molecules from small units, which has been much to the fore recently, not only because of its technological importance in the plastics, paint, rubber, textile and other industries, but for its own scientific interest.

Polmerisation and depolymerisation are influenced by oxidation: the oxidation may not only influence the rate, but may change its course. Oxidations in the liquid state are subject to similar chain reactions as occur in the gaseous state. It seems to be becoming generally agreed that in all these oxidations, the initial steps are dependent on peroxidation.

Peroxide Formation

The reacting molecule is first shaken by collision or otherwise, so that a hydrogen atom becomes detached, oxygen steps in and forms a peroxide radical which on encounter with another molecule, gives a peroxide, or if this is not stable enough to exist, the resulting complex breaks up into simpler components.

Even the oxidation at low temperatures of a solid like carbon is preceded by formation of peroxidic complexes on the surface. In fact, there seems to be some underlying theme of this kind common to combustible substances from which nature constructs a symphony of behaviour of great variety.

In the oxidation of quite a simple hydrocarbon such as n.octane, the stages of breakdown may involve the formation of a number of different peroxides, but it is not so much their formation but the manner of their break-up that determines the main course of the oxidation. The influence of inhibitors and promoters on the oxidation, which has been of importance in the study of " knock," is linked with the formation and stability of these peroxides.

There should be connection here with biological processes of oxidation and polymerisation which occur at normal temperatures in the presence of catalytic agents, such as glutathione or co-ordinated metal groupings, and one feels that in this field there is much yet to discover.

Nowadays, chemists do not accept the mere existence of atoms, radicals and molecules; they have to consider them as electrodynamic systems subject to quantum dynamical laws, described in terms of atomic and molecular orbitals, and subject to patterns of behaviour determined by shift of electron density.

A Productive Field

The study of reaction kinetics, which includes combustion and oxidation, has had a great influence towards this closer understanding of the true nature of chemical change, and this in turn has had its effect in advancing knowledge of molecular structure and reactivity.

It has not been my intention to review the great advances in chemistry made in the last 20 years, but I have intended to point out the connection it has all had with the study of combustion. The effect can be seen in other directions.

I have already mentioned that important work was done on the chain theory of reactions in Bohr's laboratory in 1923; it was to the fore there again when the possibility of propagating nuclear fission by chain reactions of fission products came to be considered.

The consequences of this to the world have been terrific. At all events, chemistry has been enriched by the filling of all the gaps in the periodic classification of the elements (43, 61, 85, 87), the provision of a new set of transition elements of atomic number greater than uranium (93 to 96) and large numbers of isotopic elements, stable and unstable, which provide further means to trace where and how reactions occur.

The combustion chemist is usually concerned with rapid reactions because of the many practical problems involving detonations, explosions or flames. It is not easy to trace what happens in these very fast reactions.

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* Abstract from the speech of the chairman of Section B—Chemistry proceedings at the annual meeting at Newcastle-upon-Tyne of the British Association for the Advancement of Science (August 31 to September 7), in the course of which he gave a comprehensive review of the work of the chief contributors, past and present, to current knowledge of combustion chemistry.

In slow combustion, from pressure change and determination of the substances formed, it is possible to understand what is happening and even to predict when, by branching or self heating, the mixture will trigger over into an explosion and ignite.

A very complete study of the hydrogen and oxygen reaction has been made in this way by Hinshelwood and his school. But to determine just what happens in an explosion or in any very rapid reaction associated with flame is not an easy experimental problem.

Polanyi, however, showed how it was possible to study fast reactions in flames at low pressures. His were sodium vapour flames burning in halogen or alkyl halides, and from the limit of the ambit of the sodium as found by its fluorescence, it was possible to determine the course of a reaction and the effectiveness of the collisions for reaction between the atoms and molecules.

Gaydon and Wolfhard in my department at South Kensington have been able to maintain stable hydrocarbon flames at quite low pressure. The zone of the flame reaction can be spread into quite a wide band, as the free path of the molecules is appreciable.

The position where the various radicals, which emit light, commence to show themselves and their temperature can be found. Altough one cannot get the whole story in this way, much about these fast reactions can be discovered. It is possible also to freeze out suddenly and analyse the products formed in a flame and so get further information about the processes, this is another line which Minkoff and Everett have been investigating in our laboratory.

Others—Coward and workers in the Safety in Mines Laboratory, Laffitte and others in France, Stevens, B. Lewis and G. von Elbe and others in America, Linnett, Boys and Corner, recently in England, have advanced our knowledge of flame propagation.

In ordinary flames, it seems that the propagation is maintained by the diffusion back into the unburnt gas of some of the radicals from the flame, rather than by the self-acceleration of the ignition reactions in the unburnt gas alone.

There may thus be a distinction between inflammation, which determines flame propagation, and ignition. Nevertheless, when the gases can be self-heated quickly at low temperature, inflammation may become a double process (involving self-ignition and subsequent inflammation), as Townend has shown with ether and acetaldehyde.

We are having a discussion about flames later and I only refer to this aspect of combustion chemistry as the subject of my address would be incomplete without some mention of it, and this ends my review of the influence which the study of combustion has had on the progress of chemistry; all along great technical developments have closely followed this growth of knowledge.

Fuel Technology Courses

MANY practical aspects of fuel technology are to be dealt with by authorities in the lecture course to be given at 7 p.m. on Tuesday evenings during the winter session, commencing October 4, at the Northampton Polytechnic, St. John Street, London, E.C.1.

Lecture subjects include "The Preparation of Synthesis Gas from Coke and Brown Coal by the Fischer-Tropsch Process"; "The Behaviour of Coal on Heating"; "Recent Developments in the Analysis and Testing of Solid Fuels"; "Liquid Fuels, Their Characteristics and Utilisation"; "Radiant Heating by Town Gas for Industrial Processing."

There is also to be a lecture course on "Ceramics, their Production, Testing and Utilisation," on Wednesday evenings at 7 p.m. Fees are: Full technology course, 30s., ceramics, 21s.

Foundry Steel Melting

TECHNICAL and economic aspects of the various processes of foundry steel melting will be discussed at a conference organised by the steel castings division of the British Iron and Steel Research Association to be held at Ashorne Hill, Leamington Spa, on Thursday and Friday, September 22 and 23.

The chair will be taken by Mr. Richard Lamb, research metallurgist.

Following the same procedure as on the three previous conferences, this year's meeting will consist of four sessions, two on each day, thus allowing ample time for discussion of the papers presented.

The four sessions will cover the cupola/converter process; electric arc process; other melting processes, and general items.

Applications for accommodation should be made to the steel castings division of the BISRA.

MEASURING DISINTEGRATION RATES

American Work on Sodium 22

THE creation of radioactivity standards and the use of radioactive isotopes as biological tracers calls for knowledge of the number of atoms disintegrating in each unit of time. One way of determining this, for radioactive substances emitting both beta and gamma radiations, according to continuing research at the U.S. National Bureau of Standards, is to count the beta and gamma emissions that occur simultaneously.

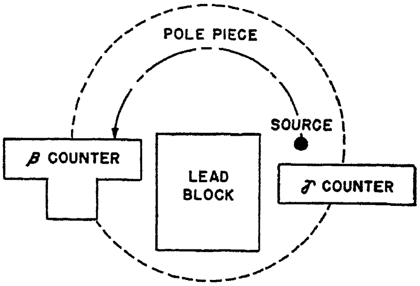
For most radioactive substances this can be done with an experimental arrangement consisting only of a radioactive source, a beta-ray counter, and a gamma-ray counter. But in the case of sodium 22, decaying to neon 22, the measurement problem becomes more difficult because each atom of sodium 22 disintegrates by emitting a positron instead of the usual electron.

In order to overcome this difficulty, workers at the Bureau of Standards have used a coincidence counting arrangement in which the beta and gamma counters are separated by a lead block and are placed in a moderate magnetic field. The radioactive source is placed near the gamma counter so that positrons emitted by the source will travel, under the influence of the magnetic field, in a semicircular path around the lead block to the beta counter. The lead block effectively prevents the annihilation radiation produced near the beta counter from reaching the gamma counter and causing false coincidences.

Gamma Counters

Gamma counting rates were determined with two different gamma counters, observing the gamma rates for each counter with and without an aluminium cover over the source. The two gamma counters were the same shape and size, differing principally in relative counting efficiency for low-energy radiation.

The difference in efficiency was caused by using different outer electrode materials—copper in one counter, platinum in the other. The aluminium shield was placed over the source to increase the amount of annihilation radiation. The aluminium does not, however, appreciably affect the number of nuclear gamma rays reaching the counter.



Coincidence counting arrangement

The results of the four experiments yield the information needed to determine (1) the true counting rate for 1.3 million-electron-volts nuclear gamma rays, (2) the counting rate for 0.5 million-volt annihilation gamma rays, (3) the relative efficiency of the two counters for 1.3 million-volt nuclear gamma rays, and (4) the relative efficiency of the two counters for 0.5 million-volt annihilation gamma rays.

The true nuclear gamma count combines with the beta count and the beta-gamma coincidence rate to make possible the computation of the absolute disintegration rate of sodium 22. If the number of atoms disintegrating per unit time is designated as N, the number of counts produced in the beta counter will be Np, where p is the probability of a beta ray entering the counter and being counted. Similarly, the true number of nuclear gamma counts is represented by Nq, where q is the corrected probability obtained by using two gamma counters, each with and without an aluminium screen over the source.

The probability of both the beta and gamma counters responding to radiation resulting from the disintegration of a single atom is then the product of the respective probabilities, so that the number of genuine coincidences per unit time is Npq. The counting rate, Np, Nq, and Npq, then gives three equations in three unknowns, readily solved for the disintegration rate N as well as the probabilities p and q. The disintegration rate for the radioactive sodium chloride solution used in these experiments at the bureau was shown to be 2.69×10^4 disintegrations per second per millilitre.

(continued overleaf)

Energy Requirements of Liquid Ammonia

Standard Calculations by Montecatini Workers

IN a paper presented at the Congress of Industrial Chemistry, Brussels, last year, and now published (*La. Chim. e l'Ind.*, 1949, *31* (6), 183-187) F. Tredici and S. Pontelli, members of the Montecatini research staff, Milan, describe methods of analysing and calculating the energy used in the production of liquid ammonia.

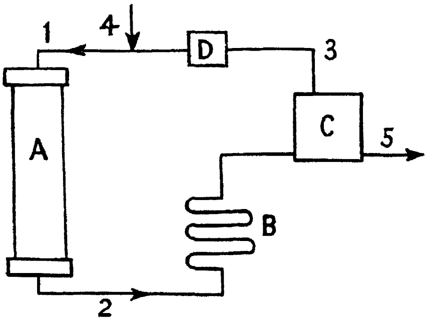


Fig. 1

The various synthetic processes according to equation $N_2 + 3H_2 = 2NH_3$ differ essentially in the pressures used; but all except that of Claude which is not considered here, may be represented by the scheme diagrammatically shown in Fig. 1, in which A is the catalyst tower, B the condenser, C the separator, and D circulator of unreacted gases.

The gas mixture passing through A emerges with an ammonia content, part of which is condensed in B, thence into separator C. It passes out at 5 as a gaseous and liquid mixture. The separator may, of course, be of varied form and function.

The mixture passing at 3 goes into recycler or circulator D, and thence again into the catalyst tower. At 4 enters the mixture from the compressors in quantity sufficient to balance effluent at 5 and circulation losses. Sometimes it enters at other points in the cycle.

Given the cycle shown in Fig. 1, it is required to determine variations of energy consumption for production of liquid ammonia under pressures ranging from 300 to 800 kg./cm.^{2}. Energy is required for (a) compression of gas mixture, (b) circulation, and (c) condensation. Comparisons are made on the basis of one ton produced.

Equations and graphs are given for each of these, from which it is shown that by far the greater part of the energy consumed is for compression of the gas mixture. From this point of view, *i.e.*, of energy used, the high percentages of ammonia formed in the synthesis column under high pressure are relatively unimportant, since they only reduce by a few kWh the energy required for circulation.

The results are summarised in graph form. Theoretical energy consumption for compression was determined, and to complete the data required it is necessary to have compressor yields and number of phases. Supposing that the total yield of the compressors with adiabatic compression is 70 per cent and the phase numbers as follows:—

for 300 and 400 kg./cm.^{2}	5 phases
„ 500 and 600 „	6 phases
„ 700 and 800 „	7 phases

then the following are energy consumptions for compression of the mixture:—

pressure: kg./cm.^{2}	300	400	500	600	700	800
energy kWh	824	886	930	987	1020	1065

MEASURING DISINTEGRATION RATES

(*continued from previous page*)

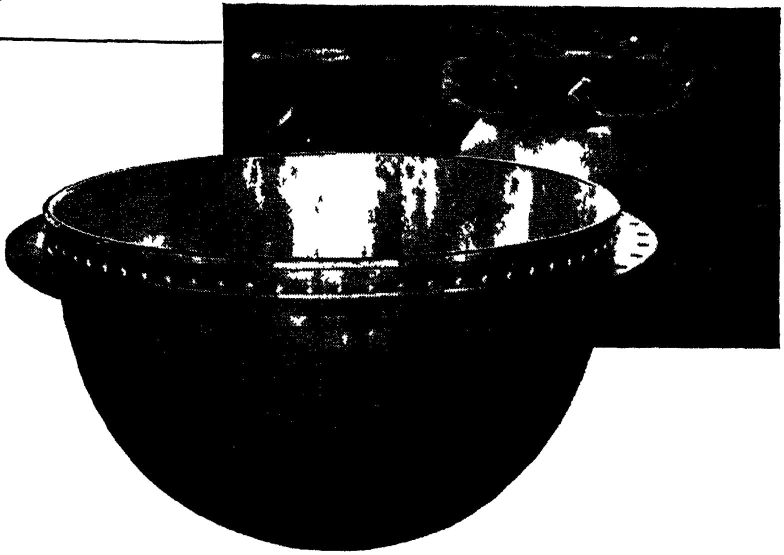
The efficiency of the platinum counter used in the bureau's work was found to be practically equal to that of the copper counter for 1.3 million-volt gamma rays, but 2.9 times as large for 0.5 million-volt annihilation radiation. When the source was covered with 1/32-in. aluminium, the counting rate for annihilation quanta increased by 25 per cent. When the copper-electrode counter was used to measure the radiation from sodium 22, about 70 per cent of the total gamma counts were due to nuclear gamma rays and 30 per cent to annihilation radiation.

The results obtained in this work on sodium 22 at the bureau agree to within a fraction of 1 per cent with the results of an independent method using electrometer measurements against a known radioactive standard. The bureau's new method for the calibration of positron emitters promises to be quite useful, especially since sodium 22 in the form of sodium chloride offers interesting possibilities for use as a biological tracer and as a gamma-ray source in medical therapy.

Metallurgical Section

Published the first Saturday in the month

Silver and fluorine



Silver is used extensively for the manufacture of equipment to handle fluorine and its compounds For certain services it is preferable to any other constructional material.

The solid silver pan illustrated is 3 ft. 6 in. in diameter and is used for the evaporation of a fluoride solution. It is typical of the work in silver undertaken in the Johnson Matthey workshops.

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Metallurgical Section

3 September 1949

MAGNETIC FLUIDS

Metal-Chemical Basis of a New Mechanical Principle

JUST over a year ago the National Bureau of Standards, Washington, published the first account of some experimental work done by J. Rabinow on the properties of magnetic powder suspensions in oil.[1]

The object was to develop a magnetic fluid clutch in which the frictional effect would be produced by coagulating the suspended metal particles through induced magnetism. The laboratory results were most encouraging, and the idea was taken up immediately by the Servomechanisms laboratory of the Massachusetts Institute of Technology and at least one of the major American automobile concerns. The National Bureau of Standards also continued its work, and a comprehensive summary of it is contained in a paper presented by H. D. Saunderson to the fifth annual meeting of the U.S. Metal Powder Association in Chicago last April.[2]

Carbonyl Iron Powder

The technical problems which arise in a magnetic fluid clutch are extremely interesting. There is, first of all, the powder. Carbonyl iron powder has proved most efficient out of a large number of powdered magnetic materials, owing to its optimum combination of permeability, resistance to corrosion from the oil, resistance to attack by oxygen and moisture, and its dispersing properties. Fine particle size is not entirely desirable for magnetic reasons, because the particles in the suspension, when exposed to a magnetic field, set up their own magnetic fields which act somewhat analogously to the counter e.m.f. in an electric motor. The most promising results have been obtained with powders of 40 microns size.

A whole range of fluids has been tried. The properties required are that the fluid should be inert towards the powder, that it should be thermally stable over a wide temperature range, that it should exhibit a minimum change in viscosity, and be capable of maintaining the powder in suspension, either alone or with a suitable additive. The trifluoromonochloroethylenes appear to be most useful, but above 230° C. they give off toxic vapours which necessitate very good sealing. Methylphenyl silicones are also useful up to the same temperature, after which decomposition occurs.

Additives may be required to obtain either thixotropy or wetting of the particle surfaces. Butyl oleate may be used up to 150° C. for producing thixotropy, though the basic fluid is not specified. Among the surface-active agents that have successfully wetted the magnetic particles at temperatures up to 90° C. are substances such as *p*-dichlorobenzene, dioctyl sodium sulpho-succinate, etc.

In addition to the Chrysler Corporation which appears to have made the largest magnetic fluid clutches in existence so far, the General Electric Company in America has also been active in this field and is stated to have built clutches with torques ranging from 0.2 in./lb. for tension devices up to 160 in./lb.

One interesting development in this work of the General Electric is the abandoning of the oil medium altogether in favour of graphite. The graphite apparently coats the particles, and the results obtained with these dry clutches are claimed to be superior to those obtained with oil suspensions.

All the difficulties have by no means yet been solved, but the National Bureau of Standards is continuing its study of magnetic fluids also for other purposes than clutches.[3] Some laboratory work is being done to test the possibilities of magnetic fluids as shock absorbers for remote control in a hydraulic system, as a low temperature casting mould material, and also as a variable electrical resistance material.

REFERENCES

[1] Nat. Bur. Standards, *Tech. News Bull.*, 1948, 32, 54-60.

[2] Proc Fifth Ann. Meeting, Metal Powder Assen. (N.Y.).

[3] Nat. Bur Standards *Tech News Bull.* 1949 33, 74-76.

Mg. ALLOYS APPRAISED

Some New Conclusions from U.S.A.

A COMPREHENSIVE survey of the mechanical properties of some 200 alloys in 40 magnesium alloy systems suggests that magnesium-zinc-silver-manganese-calcium is the most promising combination for further study and development, according to a new report, " New Magnesium Alloys," just released by the U.S. Office of Technical Services.

The study, undertaken by the Rennsselase Polytechnic Institute for the U.S. Air Force, disproves certain favourable assumptions which had previously been made regarding the high mechanical strength and good workability of the German Giesche alloy. It also shows that the addition of 5 per cent each of the intermetallic compounds $Cd_{21}Ni_5$, Cd_3Cu, and Cd_3Sb_2 failed to improve the mechanical properties of magnesium and magnesium-zinc base compositions.

Ductile Alloys

A preliminary investigation of warm rolling procedures for dilute magnesium-base alloys indicated the possibility of increased ductility and toughness with moderate strength properties through these methods, although the data were too limited in scope to draw specific conclusions.

Further study of the magnesium-zinc-aluminium-tin system agreed with earlier results indicating that magnesium-5 zinc-3 aluminium-3 tin was the best combination of this particular system.

The promising magnesium-5 zinc-1 silver 1.5 manganese 0.3 calcium alloy still has the drawbacks of hot-shortness (tendency to break under stress when being handled under high temperature) and extreme sensitivity of its mechanical properties to small variations in composition and handling procedures.

Copies of the new Report, No. PB-97657, " New Magnesium Alloys " (243 pp.) can be had as a photostat costing $31.25, or as a microfilm at $9.00, from the Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D.C.

French Contract in Brazil

Material and equipment for the oil refinery to be constructed in Brazil (capacity of 45,000 barrels a day), will be supplied by a French combine and the erection will be supervised by Hydrocarbon Research, Inc. (U.S.A.).

STAINLESS STEEL WIRE

New U.S. 500 Tons-a-month Mill

ANOTHER step has been taken in its $900 million development and modernisation programme by the United States Steel-Corporation, through its subsidiary company, the American Steel and Wire Company, by the opening of a new stainless steel wire mill at Waukegan, Illinois, with a capacity of 500 tons per month. The new plant covers 100,000 sq. ft. under one roof.

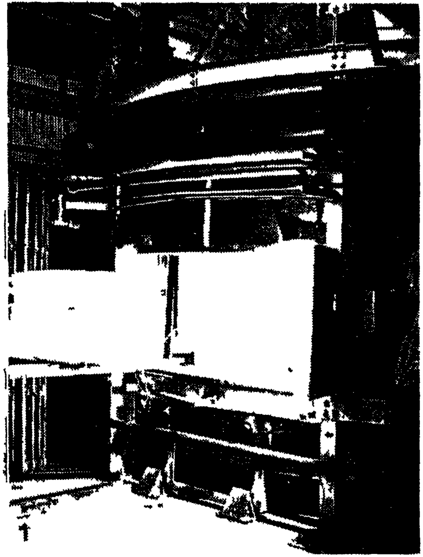
In rolling the metal for stainless steel wire, careful pyrometric control is found to be necessary, and rods are best produced slowly from billets as small as possible. Each coil averages about 170 lb., and, by a process claimed to be new to the industry, one coil is flash-welded to another to form bundles, each weighing 500 lb. Then new-type " compressors " squeeze two of these bundles together to make one compact, round 1000-lb. parcel.

Further steps in the process include spot cleaning, in which oxides are " burned off " by a caustic method using molten salt and successive baths of acids and water. One of the most important and complicated jobs is to anneal the stainless steel before it is drawn into wire to permit its smooth passage through the diamond dies. Two large and one small rotating furnaces are used for this purpose at the Waukegan plant.

The company uses a new type of coating to protect the wire as it is drafted down into finer sizes. Sometimes the wire gets a copper coating, not for greater rust-proofing, but to act as a lubricant when the wire goes into a machine that cuts threads and forms a head, as for example with nuts and bolts.

Some key processes in the new Waukegan plant are depicted on the facing page. 1. 1000 lb. of stainless steel rod leaving one of the rotary electric hearth furnaces (2000° F.). 2. Specially designed for space saving in the wire drawing process, these drawing blocks, powered from below, offer differing drawing speeds and power, the largest employing up to 60 h.p. 3. The " craneman's view," embracing the weighing and welding section, storage bins of 500 tons capacity and the rotary annealing furnaces. 4. Some of the machines which draw the finer gauges, down to .014 in. diameter, at rates varying between 300 and 900 ft. per minute

Rapid Heating and Wire Drawing



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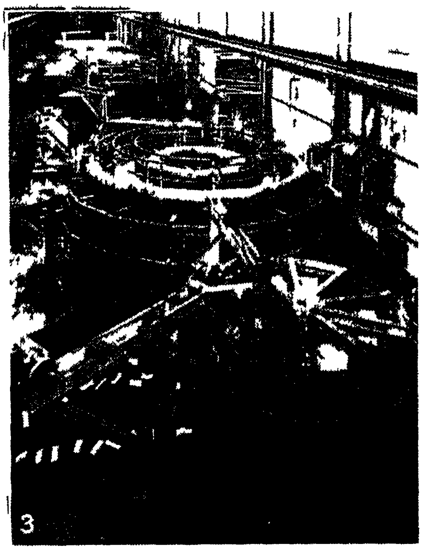

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ELECTROLYTIC IRON POWDER

Summarised Results of Recent Russian Work

IN *Zhurn. Prikladn. Khim.* for March, 1949, *22*, 312-318, L. L. Kuzmin and V. L. Kiseleva describe the electrolytic production and properties of iron powder.

In a previous note on the preparation of the powder by reduction of iron oxide with hydrogen at a high temperature (*loc. cit.*, 1948, *21*, 378) it was stated that such a method (reduction) involved the disadvantage of re-crystallisation, leading to coarsening or agglomeration of particles and reduced capacity of the iron electrode. It appeared, therefore, of interest to study a method of obtaining active iron by electrolysis in which re-crystallisation was not likely to occur.

Belger had already tried this method with high current density to obtain sponge iron. But, despite the fairly extensive literature on electrolysis of iron, this method appears to have received little attention.

Metallo-Ceramics

Balshim has studied the possibility of electrolytic methods in connection with metallo-ceramic purposes (Collected Works of NIIMASH, 1935, *12*, 5), and gives optimum conditions as follows: electrolyte $FeCl_2$ of 30 g./lit. concentration with NH_4Cl of 100 g./lit., cathodic c.d. 10 amp./dm^2, and temperature 30° C. These are similar to those specified in the A.E.G. German Patent No. 316,748.

The cathode deposit was removed by washing once per 24 hours, dried at 50° C. under vacuum (100 mm. Hg), and finally reduced in hydrogen at 750° C. The resulting powder had a purity of 99.7 per cent, passed a sieve of 100-150 mesh, and had pouring weight of 2. Powder of greater fineness tends to oxidise readily, and is unsuitable for the metallo-ceramic industry, but may be suitable for accumulators.

Special interest, however, attaches to a method of producing the iron powder without supplementary disintegration and reduction in a hydrogen atmosphere.

In the experimental work described in the Russian work the conditions of test varied as follows: concentration of electrolyte, $FeSO_4.7H_2O$, 10-300 g./lit., *p*H 1.5-4.2, cathodic c.d. D_k, 0.001-2 amp./cm^2. and temperature 15-80° C.

The purity of materials was assured and iron sulphate was prepared as described in the earlier work (*loc. cit.*). Anodes were of Armco iron, and cathodes of chrome-nickel steel, with which the formation of nickel oxide on the surface facilitated the removal of deposited iron (Müller, etc., *Zt. f. Elektrochem.*, 1941, *47*, 135); and also aided formation of deposit.

The dependence of results on c.d. and *p*H are graphed in five curves (*p*H as ordinates), with varying concentrations, and all at room temperature, except the fifth, which was 80°. The five different curves are: (A) iron sponge or powder, (B) dendrite, (C) dendritic on edges of electrode, (D) weak adherence of base metal, and (E) denser and more strongly adherent deposit.

Generally, it is concluded that increased concentration of electrolyte and higher temperature reduces the occurrence of broken or disintegrated deposit; but the introduction of sugar or glycerine into the solution, on the other hand, increases the disintegration of the deposit and the difficulty of removing it from the electrode, as well as periodical cleaning of the latter. Addition of large quantities of sodium and magnesium sulphates when working with high c.d. induces deposition of hydrated iron oxide.

The nature of the broken-up deposit varies, of course, with the conditions of electrolysis. With more acid solutions, grey dendritic metallic deposits more readily form. Reference may be made here to the case studied by Kassube and Schmellenmeier (*Zt. f. Elektrochem.*, 1941, *47*, 309).

Dendritic Deposits

These deposits tend in time to consolidate, although they still contain an appreciable amount of inclusions in the form of air-holes or blisters, the precise extent of which is difficult to define (Burmeister and Schlöter, *Metallwirtsch.*, 1934, *13*, 115). The use of these dendritic deposits for active iron electrodes without further pulverisation is not possible.

In conditions of low acidity and high c.d. the deposits tend to become coarser at first, then somewhat finer, and in certain known and recognised cases they are spongy or sludge-like, readily oxidising not only in air but also under water. Cathodic deposition may be complicated by a number of unwanted effects and in normal working it is necessary to remove evolved oxygen, prevent oxidation of Fe'' at the anode, and ensure sufficient and continuous acidity of electrolyte.

Such conditions may be secured by working with small anodic c.d. Polarisation curves are given showing that evolution of oxygen begins at about c.d. =6 amp./dm^2. Data on current distribution at the anode and cathode with varying densities are tabulated and show that, with the lower c.d., the solution of iron proceeds only at the anode. Cf. Von Konrad Georgi (*Zt. f. Elektrochem.*, 1933, 39, 745).

A special feature in electrolytic baths for the production of iron powder, as shown in details tabulated, is the uneven or unfavourable relation between electrode surfaces. Moreover, with high c.d. at the cathode and low c.d. at the anode, electrolysis is accompanied by a fall in acidity of bath.

Attempts to avoid this by introducing an auxiliary platinum anode immersed in sulphuric acid, with insulating diaphragm, and passing a part of the current through this—equivalent to the amount of hydrogen evolved at the cathode—were not successful. It was possible in this way to control the *p*H of the electrolyte, but it was inconvenient, as more time was required to determine optimum distribution of current and ensure constant acidity of electrolyte. There was also too much time lag between change in acidity and corresponding change in current distribution. Other methods were used to maintain constant *p*H, such as a flowing electrolyte.

Constancy of Current

The container had a capacity of 3 litres, and had two anodes of 1 dm^2 working surface, and between them a cathode, of comb shape, designed so that the current was kept constant at 4 amp. Each test was continued for 24 hours, during which about 100 g. of powder was produced at the cathode. Usually this could be easily removed by shaking or knocking the electrode. Only when sugar had been added to the bath was it necessary to apply mechanical periodical cleaning to remove the coating, usually of soft voluminous powdery material.

To obtain highly dispersed deposits, dilute solutions were used as electrolyte, containing (per litre of water) 25 g. $FeSO_4.7H_2O$, of *p*H 1.8-3.4, using a c.d. of 0.1-2 amp./cm^2. (It should be noted that c.d. is sometimes given per dm^2 and sometimes cm^2.) Several tests were made in which 15 g./lit. sugar was added. Sulphate ions were removed as much as possible by washing and decanting the powdered mass, which is then left for some days in water, filtered with a Buchner funnel, dried under vacuum of 100 mm. Hg at 50° C.

Drying at different temperatures (30, 50, and 90° C.) and under different pressures (25, 50, 100 mm.) confirmed Balshin's results (*loc. cit.*) that, in these conditions, there is minimum oxidation of iron. Washing with alcohol gave negative results. Detailed results, including content of three forms of iron in powder (Fe mol., Fe'' and Fe'''), and fineness, are tabulated: *p*H was 1.8 and 3.4, and c.d. from 0.1 to 2 amp./cm^2; temperature was 25° C.

Voltage Potential

With *p*H at 3.4 electrolysis proceeded under relatively high potential, and deposits were voluminous, slowly forming, and dark-coloured. Washing out sulphur from these was difficult. After drying they yielded a strongly oxidised product. With *p*H of 1.8, powders contained more metallic iron, and sulphur could be easily removed. Addition of sugar produced a fairly sharp rise in voltage potential, and deposits had lower content of metallic iron, were of a greenish tint, often voluminous, and some 2 per cent of sulphur, probably as iron sulphate, persisted.

The composition of the powders depended largely on the extent to which electrolysis was accompanied by deposition of hydrates and oxidation of the product at various stages. Deposits from solutions of *p*H 3.4, and still more so from solutions containing sugar, which interferes with control or adjustment of concentration, are contaminated with considerable amounts of hydrate. With more acid solutions (*p*H 1.8) the powders show relatively pure metallic iron. Some analyses of freshly prepared cathodic deposits under non-aerobic conditions show that the dry powder consisted of a more or less complex mixture of metallic iron, with hydrates, and with oxides in various stages of oxidation.

The dried powders, laminated, were subjected to electrical testing as described in earlier work (*loc. cit.*). They were obtained from solutions of *p*H 3.4, and even so did not absorb a charge if the Fe''' content was not fairly high, and if composition of powder did not approximate to that of powders obtained from more acid solutions. Deposits from sugared solutions, as might be expected, were in all cases passive.

Powders obtained from the more acid

solutions were better suited to moulding. After the first charge cycle they showed capacity not less than 0.1 Ah/g. of mass. In succeeding discharge cycles there was invariably noted a rapid loss of capacity. Some test specimens showed complete loss even at the third discharge cycle. It may be supposed in such cases that, at some stage or other, the powders become contaminated with foreign matter to a fairly considerable extent. It is known that, even in two-stage electrolytic refining of iron, it still invariably contains small amounts of foreign matter. With highly dispersed deposits the risk of such contamination is increased. Despite the use of pure iron (Armco) anodes qualitative tests for the presence of manganese in the cathodic deposits were positive. The negative effect of manganese has been already noted (Lyzlov, *Trans. Leningrad Khim. Tekh. Inst.*, 1941, *10*, 71).

The addition of cupric or mercuric oxide to improve efficiency of the iron electrode was recommended as long ago as the Eng. patent of Edison, No. 322/1903 (accumulator), and this method is still adopted. The present authors tried the effect of adding 6 per cent mercuric oxide, and with powders produced from acid electrolyte (*p*H 1.8) the addition markedly stabilised capacity. Some curves are shown by way of example, showing the time/voltage relation for different cycles, with and without addition of mercuric oxide.

In those cases where cathodic precipitation of iron is accompanied by an initial and rather considerable amount of hydrates, *e.g.*, in electrolysis of dilute solution with high initial *p*H, or when sugar is added, the authors note that the powders after first charge do not show measurable capacity and could not subsequently be moulded. Under these circumstances the electrochemically active particles become discrete or separated from one another by particles of adsorbed hydrated ferrous oxide readily transforming into ferric hydrate and incapable of reduction or regeneration under ordinary conditions of accumulator working.

With more acid baths and less formation of hydrate the cathodic iron is, of course, more active, even when composition and dispersion resemble those of the above inert powders. In metallic powders trivalent iron appears owing to surface oxidation at first to Fe'' and then to Fe_3O_4, which suggests firstly reduction by hydrogen and then partial oxidation.

After further consideration of the electrical tests it is concluded that electrolytic iron may be obtained in an active form if electrolysis is not accompanied by appreciable hydrate deposition and reduction of impurities to a minimum. Addition of mercuric oxide under proper conditions has a good stabilising effect on capacity. Further experiments would be of interest using insoluble anodes. Another interesting line of work would be the use of an alkaline medium, such as that adopted by Kaleida and Rozentsveig (*Collected Works on Research*, Chem. Source Elect. Current, 1935, *1*, 84).

ACTIVATED ZINC DUST—IMPROVED MEANS OF PRECIPITATION

THE cyanide process used in gold and silver mining is dependent at one stage upon the treatment of the so-called "pregnant solution," that is to say, the cyanide solution in which the ore has been leached in the presence of oxygen, with finely divided zinc in order to precipitate the gold or silver.

Hitherto zinc dust made by condensation of zinc vapour has been preferred to zinc dust made by atomisation of the molten metal, as it possesses a higher purity and a greater fineness. It is naturally a far more expensive product, but taking its efficiency into account, the gold mining industry has not hesitated to use distilled zinc dust on a very large scale.

An interesting example of technical development in this field can, therefore, be seen in a recent British Patent Specification (No. 624,317) granted to the Hudson Bay Co., in which atomised zinc dust is treated with a solution of copper and antimony (copper sulphate and tartar emetic) to give a coated zinc dust that weight for weight is both less expensive and more efficient than distilled zinc dust.

The following figures illustrate the respective efficiencies of the three kinds of zinc dust:

	Ounces of gold and silver precipitated per lb. of zinc dust	
	Gold	Silver
Atomised zinc dust	0.0016	0.081
Distilled zinc dust	0.0137	0.139
Activated zinc dust	0.0160	0.165

While production costs are a quite irrelevant factor in the fixing of gold prices, the mining companies will probably still benefit from such savings due to technical improvements.

METAL HARDNESS TESTS

Russian Criticism of Existing Methods

BECAUSE cutting tools in use are exposed to heat, a study of their qualities, especially hardness, in such condition is important. Existing methods of hardness testing have lately been reviewed in two groups by the Russian workers, A. P. Gulyaev and R. I. Mitelberg.[*]

The first group comprises the indentor type of test. It is noted first that, in tools employing diamonds, the fixing of the latter in heated metallic holders is difficult owing to the different coefficients of expansion. Methods of measuring hardness in which diamond points are used are accordingly seldom or never employed for tests in the hot state.

The Brinell method is the most commonly adopted in the first group, but the steel ball must now be replaced by one of hard alloy. In the second group an indentor is not used, but the extent of deformation caused by pressing together two test-pieces exactly identical is the criterion.

Cylindrical Test-Pieces

Of the various forms of such test-pieces the cylindrical has been deemed most suitable, disposed either parallel or crosswise. This has been used, for example, by Carter & Grove (*Trans. Amer. Inst. Min. and Metallurg. Eng.*, 1933, *105*) who endeavoured to establish a relation between Brinell hardness and " cylindrical " hardness.

In the present work tests were first made with the Brinell hydraulic press and with electric heating for the test-piece and adjacent parts of apparatus. The load applied was 3000 kg./30 sec. and times of heating at a given temperature were 15, 60 and 120 minutes.

With a test-piece of given dimensions and a stated load, the conversion coefficient from cylindrical hardness to Brinell hardness was 1.52.

The following Russian steels were tested, the table including R_C hardness after tempering in oil for 1½-2 min. at 1230-1280°C. (1180° for test-piece No. 6) and annealing.

								%
No.	Mark	C	W	Cr	V	Co	Ti	Rc
1	RK10	0.86	18.1	4.2	1.5	9.4	—	66
2	RF1	0.69	18.4	3.9	1.2	—	—	65
3	EI262	0.90	9.4	4.3	2.5	—	—	65
4	EI381	0.80	4.3	6.6	3.3	—	—	63
5	EI382	0.83	4.6	4.8	2.4	—	0.1	62
6	EI184	0.93	4.9	7.3	1.4	—	—	64

These were hardness tested at temperatures of 300, 400, 500, 600, 650 and 700°C. The results graphed and tabulated show Brinell units and width of impress at these temperatures after 15, 60, and 120 minutes' exposure (in averages of four tests).

Steel No. 1 showed little change up to 500°, after which its hardness fell from 700 H_B to 260 at 700°C. Steels Nos. 2, 3, and 4 began to soften at about 400° C. and at 700°C. were much softer than No. 1, while steels 5 and 6 softened still earlier and finally to a greater extent. It is generally concluded that, so far as red hardness in these steels is considered, it is sufficient to test them cold.

No Universal Method

The fundamental method of determining and calculating hardness is the subject of a study by V. K. Grigorovich. The three well known methods of hardness testing, namely: Brinell, Rockwell, and Vickers, and their relevant formulæ, do not wholly fulfil all the conditions, at least from the point of view of universal application and standardisation.

The author describes the essential requirements thus: (1) The method must be capable of use with both plastic and brittle materials, whether of micro- or macro-dimensions; (2) the hardness determined should be reliable as a characteristic constant independent within wide limits of the load applied; (3) relevant calculations should be simple and reliable, so that hardness has a definite physical significance. (4) The apparatus and use must be simple and reliable.

There are good reasons why existing instruments should be capable of adaptation to these desiderata. The Brinell machine, for example, is not capable of universal application, since the steel indentor naturally cannot be used for very hard materials or alloys. If the steel ball is replaced by a diamond, as in the Shore monotrone, the conversion is expensive and inconvenient; tests under various loads would need a large number of diamond indentors.

The second condition also is difficult to fulfil. Independence of hardness number of magnitude of load is attainable only by maintaining mechanical similarity, which means similarity of geometrical form of impress. But this form often differs under varying load for the same hardness of test-piece. Thus the Brinell hardness number and formula relating load to diameter squared (P/d_2) is not strictly valid under different loads: with increasing loads this ratio increases. For this and other reasons the Brinell method is considered unsatisfactory.

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[*] *Zavodskaya Lab.* (Vol. 15, 1949, pp.447-453, 457-460)

On similar grounds, the Rockwell instrument (loads 150, 100, and 60 kg.) and the Superficial Rockwell (loads 45, 30, and 15 kg.) are not suitable for a wide variety of materials, including micro work, and also fail in respect to the second condition. For each load combination and type of indentor there are special hardness numbers not comparable with other scales.

Experiments are stated to have shown that the use of a diamond pyramid, especially in connection with micro-hardness work, approaches more nearly to what is required. In any case, it conforms more closely with the second stipulated condition, since the impress has the same form, irrespective of load, in the case of uniform hardness and yields a constant characteristic. It is well known that in micro-hardness tests the value sometimes increases, due to tempering, or other irregularities.

Reference is made to earlier work of Smit and Sendlend (*Jnl. Iron and Steel Inst.*, 1925, *1*, 285-304) who endeavoured to correlate results by this method with those of the Brinell method. On the basis of their proposals, the author suggests that calculation should be based on the assumption that the hardness number given by the pyramid indentor is independent of load, and that at all depths of indentation the relation of area to lateral dimensions is constant.

A formula is given for pyramid area and for average pressure (force) exerted per unit area of impress, which in turn may be related to projection area of impress, so that finally hardness may be calculated thus:—

$$H_{\text{np}} = \frac{P}{S_{\text{np}}} = \frac{2P}{d^2}$$

This is somewhat simpler than existing formulæ and seems to fulfil the requirements of a definite physical constant. Changing over to this formula does not present any difficulties, since between both hardness figures there is the constant relation $H_{\text{ap}} = 1.078\ H_v$, owing to the simple geometry of the pyramid indentor. Change in method of calculation does not involve any change in construction or basic principles of existing apparatus.

METAL WORKERS' SAFEGUARDS

New Devices in the U.S.S.R.

REPORTS from the U.S.S.R. state that the Labour Safety Museum of the All Union Central Council of Trade Unions has been reconstructed and considerably supplemented by exhibits showing the latest achievements in safety equipment. Interesting additions are protective devices for planing and turning lathes for high-speed metal cutting. These safeguards are based on the photo-electric principle and ensure that, should a worker put his hand into the machine, the mechanism will stop instantly.

A special section is devoted to the protection of workers in metal foundries. Models demonstrate the latest method of disposing of furnace fumes, developed by the Kharkov Labour Protection Institute. A special ring is inserted in the cupola furnace which selectively prevents the fumes from emerging and directs them to a secondary burning chamber where they are rendered harmless. This method also serves to pre-heat the air blast of the furnace. An effective means of improving conditions of workers in heating and forging sections of mills is a device which creates a water curtain in front of the furnace.

This year, many new safety technique laboratories have been established at new Soviet Russian works. The safety technique laboratory is the centre of industrial welfare propaganda on a large scale. Each new worker is here shown the safety technique devices for his works.

Rumanian-Russian Monopolies

RUMANIA and the U.S.S.R. have recently signed agreements providing for the establishment of three new Rumanian companies in which 50 per cent of the capital will be owned by the Soviet Union. These companies will control coal mining, metal production and building material manufacture. At the same time, agreements were signed for the extension of the activities of the six mixed companies already in existence. Thus, there are now nine such companies controlling the most important sectors of Rumania's economy: Sovrompetrol (oil), Sovromlemn (timber and timber products), Sovromtransport (transport), Sovromtraktor (agricultural machinery), Sovromchim (chemicals, mainly fertilisers), Sovromgas (exploitation of natural gas resources) and the new companies mentioned—Sovromcarbune, Sovrommetal and Sovromconstructii.

METAL RESOURCES OF JUGOSLAVIA

Scope for Wide Development of Home Materials

OF vital importance to the economy of Eastern Europe are the mineral resources of Jugoslavia, which seem likely to become a consideration of major importance in the "cold war" between the Soviet "bloc" and the Western nations.

The potentialities of Jugoslavia's large mineral resources which have until lately been little developed, were recently described in an article in *The South African Mining and Engineering Journal* (60, 1), from which the following facts are abstracted.

Iron ore of good quality occurs in large quantities near the surface at Ljubija, in Bosnia, where it is mined by the State authorities and sold for export. Another iron mine is worked by the State at Vares in Bosnia, in conjunction with a coal mine, an iron-smelting establishment, and the iron works at Zenica.

Before the war metallurgical activities were on a comparatively primitive scale, production being confined to pig-iron and small castings.

There are also iron works at Jesenice in Slovenia, which had a pre-war capacity of 70,000 tons per annum and produced bar iron, iron and steel sheets, steel rails up to 22 kg. per metre (as used in the Bosnian narrow-gauge railways), rolled iron, drawn iron and iron rails.

Bar iron is manufactured at Store in Slovenia, steel and steel springs at Gustanj on the Maribor-Klagenfurt railway, and highly silicated foundry iron is produced at Sopusico in Slovenia.

In September, 1939, a new blast furnace rated at 25,000 tons a year was lighted at Caprak, and a second furnace was planned in the same year.

Pig Iron

Total production of pig-iron during 1939 was estimated at approximately 70,000 tons, while the output of iron ore was in the vicinity of 600,000 tons annually.

Jugoslavia is the largest producer in Europe of antimony ore. There are deposits at Sejaca, near Loznica, at Krupanj, and near Ivanjica, to the south of Central Serbia. The Krupanj deposits used to be mined and smelted by a British company, Podrinje Mines, Ltd.

The metal content of the ore produced in Jugoslavia in 1939 was 4220 tons, and production for 1940, the last year for which statistics are available, was estimated at 4860 tons.

Copper is produced at Bur and Majdanpek in Serbia. For several years before the war the output was increased sharply, a record production of 63,000 metric tons having been reported for 1939.

Chromite

Production of crude chromite in 1939 was 54,097 tons, the leading producer being a British firm, the Allatini Mines, Ltd., which operated several properties, including the Orasie mine and a washing plant at Radusa with a daily capacity of 100 tons of ore.

Small deposits, grading 25 to 30 per cent Cr_2O_3, in serpentised peridotite bodies predominate. The iron content ranges from 12 to 16 per cent and in the concentrates SiO_2 ranges from 4 to 6 per cent.

Lead mining and smelting is a Jugoslavian industry which has been assuming increasing importance in recent years. In 1939 mine production amounted to 775,000 metric tons of ore containing 69,000 metric tons of lead.

New exploration work was in progress at the Stantrg mine, while another important producer was the Mezica mines, formerly operated by a British company, Central European Mines, Ltd.

A blast furnace and three orehearths having a combined annual capacity of 17,000 tons of metal are operated at Zerjav, where about a thousand men are employed.

Trepca Mines—formerly British owned—used to be the only important zinc producer in Jugoslavia, owning the Kopaonik, Zletovo and Novo Brdo properties as well as the Stantrg mine.

At the Mezica lead mines in the Karawanken Alps of Northern Jugoslavia, the run-of-mine ore averages about 13.5 per cent lead and 5 per cent zinc, and the zinc content appears to be increasing in depth.

Preparations for building an electrolytic zinc plant at Sabac by a subsidiary company of Trepca Mines were well advanced at the outbreak of war.

Among the minerals exported from Jugoslavia is bauxite from Dalmatia and Herzegovina. Before the war production was in the vicinity of 350,000 metric tons

(*continued overleaf*)

Non-Ferrous Metal Statistics

Heavy Stocks of Copper, Zinc and Tin in July

THE record production, consumption and stocks of non-ferrous metals in the United Kingdom in July, supplied by the British Bureau of Non-Ferrous Metal Statistics (an abstract from which is published below) again reveals a fairly general increase in stocks. Closing stocks of blister copper were 12,836 tons more than at the end of June; those of refined copper increased by 2228 tons; unwrought zinc in concentrates by 9515 tons; slab zinc (all grades) by 6329 tons; tin metal by 623 tons.

Imported virgin lead stocks were 3591 tons less han at the end of June, and English refined lead decreased by 1378 tons.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS :		
Govt. and consumers'	38,787	88,238
Imports	22,150	17,900
PRODUCTION :		
Primary	—	7,500
Secondary	2,805*	5,002
CONSUMPTION :	7,578	22,667
Secondary	—	11,962
Exports	3,160†	48
CLOSING STOCKS :		
Govt. and consumers'	51,623	90,461

* Rough copper.

† Includes 1200 tons rough copper dispatched to Belgium and 1960 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	21,685	long tons
Alloyed copper products	18,217	,, ,,
Copper sulphate	3,228	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS :		
Govt. and consumers'	13,841	75,389
Imports	15,384	13,048
PRODUCTION :		
Virgin and remelted ...		4,733
CONSUMPTION :		
Virgin (incl. debased)	5,869	12,521
Remelted and scrap ...		6,630*
Exports		25
CLOSING STOCKS :		
Govt. and consumers'	23,356	81,718

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS :				
Other than Govt and consumers'	51	55,614	4,034	- -
IMPORTS	30	6,158	—	15
PRODUCTION ..	171	—	1,617	—
CONSUMPTION ...	215	10,751	2,995	10,124
Exports		10	—	
CLOSING STOCKS :				
Other than Govt. and consumers'	37	52,023	2,656	- -

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	16,385
IMPORTS	-
PRODUCTION	2,280
CONSUMPTION	1,399
EXPORTS AND RE-EXPORTS	311

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	298
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	230

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM ...	32,85

METAL RESOURCES OF JUGOSLAVIA

(*continued from previous page*)

annually, the bulk of the output being purchased by Germany.

During the war the Croatian Aluminium Co. was formed at Agram with a capital of 20 million kroner to erect an alumina plant with an annual capacity of 100,000 tons and a reduction plant with a 50,000-ton annual capacity near Hum, Herzegovina.

The ore is obtained from large deposits in the Karst region of Dalmatia and Herzegovina, where bauxite containing 54 to 60 per cent Al_2O_3 is abundant.

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PLANT AND POWER FOR AUSTRALIA

Big Development Programme for New Industries

A LARGE increase in the industrial development in some parts of Australia is foreshadowed by recent authorisations bringing to £500 million the total it is intended to spend on electric power generating facilities. Of the total, some £160.5 million will be earmarked for short-term projects designed to treble the present power-generating capacity by 1954, when the output is expected to be about six million kW.

This is in addition to the Snowy Mountains hydro-electric and irrigation scheme which will have a power output of nearly 2 million kW and will itself cost over £160 million.

All the States are, in addition, increasing the development of their coal resources. A spokesman for the Federal Bureau of Mineral Resources has indicated that revised estimates put black coal reserves at nearly 50 billion tons. This is expected to be further increased as present surveys are completed.

The greatest development will be in Queensland, where there are great deposits of first grade black coal near Blair Athol and at Callide. These can be mined by open-cast methods. The cost of production with modern equipment, is said to be less than that of coal mined by cheap labour in Manchuria, and may provide Australia with the world's cheapest coal.

Potash Fertiliser Industry

Since the end of the war, a considerable change has come over the industrial scene in the State of Western Australia. A new potash fertiliser industry has recently been established in the Meredin district, about 170 miles east of Perth. This industry, working alunite deposits in the almost dry beds of several old lakes in the area, is now producing potash for agricultural purposes at the rate of 4000 tons a year.

Before the war, Australia imported nearly all her potash fertiliser requirements, amounting to over 11,000 tons a year. In a few years, the Western Australian industry will be able to supply the potash needs of the country. It is estimated that the lake alunite would yield 750,000 tons of potash. A private company set out to work the deposits in 1940, but got into financial difficulties. The industry has since been financed by the Western Australian Government.

Another industry, quite new to the State, which is meeting with considerable success is the wood-distillation and charcoal iron plant at Wundowie, in the Darling Ranges, 41 miles from Perth. It made history last year when it produced the State's first pig iron. Western Australia has large forest areas, and the main object of the Wundowie plant was to experiment with the means of using the immense amount of waste timber and local ore deposits.

Western Australia possesses immense deposits of high-grade iron ore, much of it contained in three islands in Yampi Sound on the north-west coast. The deposits on Cockatoo Island are being worked by Broken Hill Proprietary, Ltd., which will use the ore at its steel works in New South Wales.

S. African Scientific Conference

A REGIONAL scientific conference is to be held from October 17 to 28, at the University of the Witwatersrand, Johannesburg, under the auspices of the South African Council for Scientific and Industrial Research, at which, it is expected, all the territories in Africa south of the Sahara will be represented. Invitations have been accepted by Great Britain, France, Belgium and Portugal, while representatives from UNESCO, WHO, FAO, and the U.S.A., will attend as observers.

The broad purpose of the conference is to examine and report on the possibilities of facilitating and co-ordinating scientific research on problems of common interest to Governments concerned with the development of African territories. The agenda includes subjects for discussion such as geology, geophysics, meteorology and hydrology, soils and plant life, animal life, health, medical and social research, and industrial technology.

The South African organising and reception committees are under the chairmanship of Mr. P. S. J. du Toit, deputy president of the South African Council for Scientific and Industrial Research.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

INDICATING still another industrial application of radioactive isotopes, engineers of the General Electric Company, Schenectady, New York, have begun to put the principle to work on problems of rust control. The engineers have disclosed that they are using radioactive "tracers" to detect photographically how rust starts, where it begins, and how deep it goes. The engineers have followed this procedure:—

(1) A solution containing radioactive iron is electroplated on the surface of a metal to be studied;

(2) a photographic plate is then placed against the metal surface for several days, while the radioactive coating makes an X-ray exposure on the plate;

(3) as the test metal rusts, radiation decreases and shows up as a light area on the photographic plate. By making a series of these records, such facts as the first incidence of rust in different materials and its rate and manner of spread can be accurately plotted.

* * *

Citing the development as evidence of the company's optimistic view of chemical prospects, the president of the Dow Chemical Company, Midland, Michigan, Mr. L. L. Doan, has announced plans for the construction of a new $5 million ammonia plant to be erected at Freeport, Texas. The plant will have a capacity of approximately 100 tons per day. Field construction is expected to start about January 1, 1950, and it is expected that the plant will be in operation late next year. The plant will employ hydrogen available from Dow's chlorine plant at Freeport with nitrogen from the air to form anhydrous ammonia.

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A new peacetime record in the production of primary aluminium was established by the American industry in May. The Aluminium Association discloses that the industry produced 113,840,944 lb. of primary metal during May, topping all production figures for any month since August 1944. It was almost 3 million lb. more than was produced in the same month a year ago, and about 9.8 million lb. above the average monthly production during 1948.

A U.S.A. market for ilmenite containing approximately 52 to 54 per cent of titanium dioxide is being sought by the Ceylon Government. The Embassy of Ceylon in Washington reports that a plant is being established for the separation of ilmenite, zircon, and rutile, from an extensive beach sand deposit. It is anticipated that the plant will be in production by the end of 1950 with an annual output of approximately 60,000 tons of separated ilmenite. The Government would like to sell this product on a long-term contract.

* * *

A broad survey of the potential uses of titanium is to be given by O. C. Ralston and F. J. Cservenyak, of the U.S. Bureau of Mines, at a symposium at the American Chemical Society's 116th national meeting, which opens in Atlantic City, New Jersey, on September 18. Dr. Bruce W. Gonser will report the results of his research in titanium alloys at the Batelle Memorial Institute, and three industrial chemists of the Westinghouse Electric Corporation will present their findings on the preparation and properties of certain alloys with a titanium base. Dr. G. H. Spencer-Strong and R. F. Patrick, of the Pemco Corporation, will describe how an important industry has already been built by using a titanium compound in the making of porcelain enamel. D. R. Carmody and R. J. Speer, of the Texas Research Foundation, will discuss the use of titanium compounds in dry cleaning and laundry applications.

* * *

One of the fullest reviews of characteristics of the element sodium since it was first isolated by Sir Humphrey Davy in 1807, has been issued by the National Distillers Chemical Corporation, New York, as a 50-page booklet describing the element, its reactions and industrial uses. The publication contains many pertinent equations and an extensive bibliography listing 304 references to articles and patents. Its table of contents includes such sodium topics as: history, handling and storage, properties, industrial applications, and chemical reactions.

Technical Publications

JOINT consultation—its aims and importance—is the subject of a special number of "Ingot," the magazine of Richard Thomas and Baldwins, Ltd. There is an introductory article by Sir George Schuster and a summing up by Mr. E. H. Lever, chairman of the company. It is pointed out that joint consultation is primarily dependent on mutual confidence and the will to agree. Some clever camera studies emphasise the importance of the human side and clearly show how widely representative joint production consultative and advisory committees must be if it is to be effective.

* * *

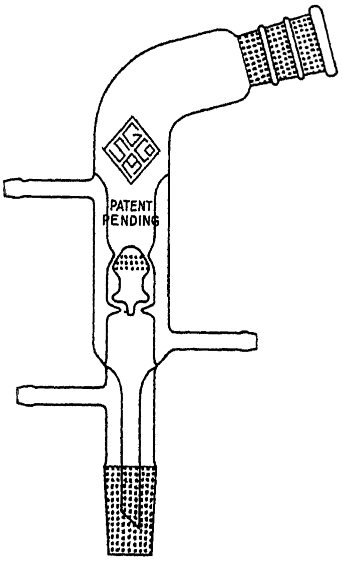
THE use of teak and oak for laboratory fittings is recommended in a leaflet recently issued by A. Gallenkamp & Co., Ltd., describing some of the company's recent additions to its range of standard units. Easy installation, flexibility, silence in use, and comparative resistance to corrosive fumes are among the advantages claimed for this unit method in wood, which permits rapid rearrangement both of the bench layout and of the service fittings.

* * *

"NUCLEONICS" is the title of a new monthly publication dealing with nuclear technology introduced by the McGraw-Hill Publishing Co., London. Among the correspondents are: G. Hevesey, Nobel prize winner in chemistry, member of the Institute for Theoretical Physics, Copenhagen; P. Scherrer, Swiss Atomic Energy Commission; E. Bretscher, Atomic Energy Research Establishment, Harwell, England; L. Yaffe, Atomic Energy Project, Chalk River, Canada; C. L. Bakker, director, Institute for Nuclear Physics Research, Amsterdam; and Hans Kopfermann, University of Goettingen, Germany.

* * *

THE Zinc Development Association, Lincoln House, Turl Street, Oxford, and its affiliated associations deal in the latest *Zinc Bulletin* with zinc alloy castings in the motor industry, which consumes a greater quantity of zinc each year than any other industry, and has held this lead for many years now. A reflection of this is the fact that a single modern motor car may contain some 150 zinc castings for mechanical, coachwork and electrical fittings, as shown in a diagram in the bulletin. Another article describes the process of Sherardising and its uses and how zinc in such applications can defeat the combined attack of corrosion and periodic stresses on steel and aluminium.



Modern American scientific glassware—the new Theimer glass vacuum adapter for fractional distillation

* * *

THE addition to water of wetting agents to improve its effectiveness for fire fighting purposes is the subject of experiments described in an article by members of the Joint Fire Research Organisation of the Fire Offices' Committee and the Department of Scientific and Industrial Research in the current issue of the *FPA Journal* (No. 6, July). It was found that wetting agents were valuable for controlling heath fires, by employing them in the saturation of unburnt materials ahead of the fire, the reduction of surface tension greatly facilitating the wetting operation.

* * *

THE work of the DSIR, its origin and the scope of its many research establishments, are described in a well produced booklet, "DSIR" (H.M. Stationery Office, 1s.) just issued.

◆ PERSONAL ◆

THE Pharmaceutical Society announces the award of two Fellowships of the value of £300 a year for two years. The Ransom Fellowship has been won by MR. R. A. WEBB, B.Pharm. (London), B.Sc. (London), 4 Higham Road, Woodford Green, who will do research work in organic chemistry at the University of London School of Pharmacy. MR. B. K. MARTIN, B.Pharm. (London), 65 Peveril Road, Beeston, Nottingham, who wins the society's own scholarship, undertakes at Nottingham University an investigation of the synthesis of pteridines and other related heterocyclic compounds.

The award of two Merck postdoctoral fellowships in the natural sciences for the year 1949-50 is announced by the Canadian National Research Council, at Ottawa. Grants have been made to DR. D. A. I. GORING, of McGill University's department of physical chemistry, who will study colloid science under Prof. F. J. W. Roughton, F.R.S., at Cambridge University, and to DR. M. J. MILLER, of the Institute of Parasitology at Macdonald College, who will pursue his studies in medical parasitology and clinical tropical medicine under the direction of the School of Tropical Medicine at the University of Calcutta, India. The purpose of the Merck Fellowships is to give special training and experience to young men and women who have demonstrated marked ability in research in chemical or biological science and who wish to broaden their fields of activity.

PROF. THEODORE SVEDBERG, Swedish Nobel laureate and veteran of physico-chemical research, who will shortly relinquish his lectureship, to become emeritus professor of Uppsala University recently delivered a valedictory address before the Society of Chemistry of Uppsala.

COLONEL G. G. H. BOLTON, marketing director of the North-Western Divisional Board, National Coal Board, has been appointed deputy chairman. He succeeds MR. W. J. DRUMMOND, who was appointed chairman of the Divisional Board in June.

DR. JACK M. ROWSON, head of the pharmacy department of Sunderland Technical College, has taken up the appointment as curator of the museum of the Pharmaceutical Society of Great Britain.

DR. H. N. RYDON has been appointed reader in organic chemistry in the Imperial College of Science and Technology.

The American Chemical Society announces the following awards:—DR. AGNES FAY MORGAN, a pioneer in the chemical study of nutrition and dietetics, and since 1938 head of the University of California's department of home economics, is to receive the 1949 Francis P. Garvin medal honouring women in chemistry. DR. HENRY A. LARDY, associate professor of biochemistry in the University of Wisconsin, will receive the bronze medal and $1000 Paul-Lewis Laboratories award in enzyme chemistry. DR. GEORGE R. GREENBANK, of the U.S. Department of Agriculture, receives the gold medal and $1000 Borden award in the chemistry of milk.

MR. A. A. POLLOCK has retired from the post of director and chief mechanical engineer of The British Thomson-Houston Co., but will remain available in a consultative capacity. He has been associated with a number of developments in design and technique. MR. K. R. HOPKIRK has been appointed to succeed Mr. Pollock as chief mechanical engineer

MR. HERBERT STANLEY DIGGORY, of Ryecroft, Ruabon, managing director of Diggory & Co., Ltd., chemical manufacturers, of Liverpool, and a director of Graeffer's Salicylates, Ltd., Hawarden, who died intestate, left £30,181 (net £27,732).

To Survey Greenland Lead

A PARTY comprising 32 Swedish geologists, prospectors, miners and airmen is to accompany an expedition organised by the Danish Government to East Greenland, where the Danish explorer, Dr. Lauge Koch, last year made remarkable discoveries of lead-ore and other minerals in King Oscar Fjord. At the edge of the inland ice, large quantities of 84 per cent lead-ore were found as surface deposits and it is believed that at this site alone, some 1 million tons of lead could be mined. The Swedish experts will check Dr. Lauge's observations, which suggest this is one of the world's largest lead-ore lodes. The party will be led by a member of the Swedish State Geological Survey and will include staff of the Swedish Boliden concern and 11 Swiss and six British members.

◆ HOME ◆

Kaolin Exports Halved

Devon and Cornwall china clay exports in July totalled only 16,499 tons, little more than half the quantities exported in the corresponding months of 1948 and 1947.

Textile Technology

A refresher course in textile technology arranged in conjunction with the Midlands Section of the Textile Institute and of the Society of Dyers and Colourists is to be held in November at the Leicester College of Technology and Commerce.

Diatomite Production in Skye

Good progress is being made in the development of the diatomite workings in Skye, helped by favourable weather. Roads are being developed and a limited amount of production and disposal is in progress, pending the development of the fully mechanised scheme of production.

Gas Prices Raised

An increase in gas prices representing an average addition of 1.64d. per therm has been announced by the North-East Region Gas Board. The higher prices are to cover the deficiency, estimated to be £575,000, incurred since the board assumed control just under a year ago.

Substituted Thioureas

British Chemicals & Biologicals, Ltd., announces that the following substituted thioureas are now in commercial production: ethylene, α-naphthyl, phenyl, o-tolyl, di-o-tolyl. Other thioureas which are available in research quantities are: n-aml, ethyl, n-hexyl, β-naphthyl, n-propyl, m-tolyl, p-tolyl.

New Control of I.T.D., Ltd.

The Austin Motor Co., Ltd., and Crompton Parkinson, Ltd., announce that, through their joint subsidiary company, Austin Crompton Parkinson Electric Vehicles, Ltd., they have acquired control of I.D.T., Ltd., of Stacatruc House, 142 Sloane Street, London, S.W.1. I.D.T. is the sole distributor of the petrol-driven range of British industrial fork lift trucks and ancillary materials-handling equipment marketed under the trade names Stacatruc and Aerolift. Mr. L. P. Lord, chairman and managing director of the Austin Motor Company, has been elected chairman, and Col. Raymond T. Hartmann will continue as managing director of I.D.T., Ltd.

Plastic Floor Tiles

Flexible and resilient tiles, which will not support combustion, and have virtually no water-absorption are now being manufactured by De La Rue Floors and Furnishings, Ltd., at its Tynemouth factory. The tiles, in a variety of colours, are said to be impervious to most acids, oils, alkalis and alcohol.

Export Progress

Industrial achievement towards the export targets for the end of 1949 was shown in figures published by the *Board of Trade Journal* (157, 384). July rates with targets (in brackets) were: Chemicals, dyes and dyestuffs, paints, pigments, varnishes, etc. (£ million): 5.27 (7.25); drugs and medicines 1.16 (1.75); oils, fats, and resins 1.21 (1.35).

Coal Output

Last week's total output of coal in Britain was 238,600 tons less than in the previous week, due, apparently, to the strike of pit cage winders. Comparative figures are:—Last week: 3,771,400 tons (deep-mined 3,509,700 tons, opencast 261,700 tons). Previous week: 4,010,000 tons (deep-mined 3,748,300 tons, opencast 261,700 tons).

Galvanised Tank Prices Reduced

As a result of the reduction in the cost of raw materials a decrease equivalent to 2½ per cent of the basic prices of galvanised tanks and cisterns manufactured by members of the Associated Tank Manufacturers has been announced by the Minister of Works. The new rate affects all deliveries made on and after Monday, August 15, 1949.

Solvents Prices Reduced

Reduction of the prices of several solvents was announced by Shell Chemicals, Ltd., last week. Prices, per ton, for amounts less than 1 ton up to 100 tons and over, in 40/45 gallon drums, range between the following (the previous price being shown in parenthesis): Methyl ethyl ketone, £99 10s. to £95 10s. (£103 to £100); methyl isobutyl ketone, £136 to £132 (£143 to £140); secondary butyl alcohol, £107 to £103 (£123 to £120); isopropyl ether, £99 to £95. Delivery is free, and bulk deliveries in tank wagons are subject to rebate (minimum 400 gal.).

OVERSEAS

Ceramic Research in U.S.A.

Investigations into the source of gases causing blisters, bubbles in glazes and similar defects in fired ware, will form part of the research programme established by the Edward Orton, Jnr., Ceramic Foundation, at Ohio State University, Columbus, U.S.A.

Welsbach Honoured

A statue of Karl Auer von Welsbach has been erected at Treibach, Carinthia, the place of his famous achievements. Dr. Hopfner, Rector of the Technical High School, Vienna, in a memorial speech, recalled the important changes in science and industry which had followed his innovations—the Auer light, the osmium lamp, the cerium iron, the metal-fibre lamps, etc.

Subsidies for Chilean Copper

The Chilean Minister of Finance, Sr. Alessandri, has submitted to Congress a project for the payment of subsidies to smaller copper producers, involving an annual outlay of some 80 million pesos. This measure is to enable small-scale units to maintain operations while copper prices decline on the U.S. market. Subsidies are to be granted as soon as the official U.S. copper price falls below 20 cents per lb.

Brazilian Fertiliser Company

The Cia Brasileira de Adubos has been formed in Sao Paulo to manufacture superphosphates, states the U.S. *Exporters' Digest*. The company, combining French and Brazilian interests, is expected to begin production in the course of a few months. M. J. L. Le Cornec, president of the Comptoir des Phosphates de l'Afrique du Nord, is one of the founders. Raw phosphates will be brought from North Africa.

Swiss Chemical Exports

July exports from Switzerland of chemicals, pharmaceuticals, dyestuffs and perfumery reached a total value of Fr.42 million, against Fr.41.1 million in June. Industrial chemicals fell from Fr. 5.8 million to Fr. 4.9 million, and shipments of pharmaceutical products declined from Fr. 16.8 million to Fr. 14.7 million. These decreases were, however, more than offset by the marked rise in dyestuff exports, from Fr. 16.6 million to Fr. 20.3 million. There was also a small increase in the value of perfumery exports from Fr. 1.9 million to Fr. 2.1 million.

Textile Chemicals Plant

According to the *Exporters' Digest*, a U.S. monthly, E. F. Drew & Co., Ltd., of New York, is reported to be planning a Sao Paulo plant to make textile chemicals. The company now imports raw materials from Brazil, processes and re-exports them.

Plastic "Lung"

The Swedish epidemics hospital is trying out a substitute for the iron lung which is made of plastic material. It is hoped that this will allow sufferers from infantile paralysis to occupy ordinary hospital beds instead of the tent-like fixtures at present in use.

Ample Production of Tannery Materials

Italy's production of tanning materials is reported to have reached the pre-war figure of 36,000 to 38,000 metric tons annually. Domestic requirements are being met in full and a lively export business has been developed. The U.K., Switzerland, Czechoslovakia and Germany are the chief markets.

Chilean Oil Expansion

The Chilean Corporacion de Fomento de la Produccion is reported to be spending $2 million to expand production of its commercial oilfield at Cerro Manantiales (Spring Hill), Terra del Fuego. A terminal storage capacity of 215,000 barrels is proposed and the whole may be in operation by the end of this year.

Belgian Labour Agreement

A commission on the chemical industry has ratified a collective bargaining agreement on justifiable absences from work. These, the agreement states, should be paid at the usual rates (and here a list of justifiable reasons are given), but in order not to hold up important and urgent work, the worker should be prepared to work overtime, for which he will be paid at overtime rates.

U.S. Plastics Exhibition

The 1950 U.S. National Plastics Exposition, a four-day event in which every major part of the American plastics industry participates, will take place during March 28-31 at the Navy Pier, Chicago, Illinois. An official of the Society of the Plastics Industry has announced: "Our next industry show is shaping as a place for producers and processors to come together with end-users to merchandise ideas as well as products."

THE PUBLISHER'S PROBLEM

High Costs and Little Paper

"INDUSTRY is still, unhappily, deprived to a considerable extent of the information and the services of the Trade Press on the scale to which it was accustomed before the war, and which publishers are ready and eager to restore if the Government will get out of the commodity markets and enable business to flow along normal channels," said Mr. E. Glanvill Benn, chairman, at the recent 53rd annual general meeting of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE and associated journals. "There is no world shortage of wood pulp, yet in this country supplies of the raw material for the paper industry are still most severely restricted."

The chairman said that sales of the company's journals overseas had again expanded, while larger sales at home had been made possible by the slightly larger allocations of paper during the year; but it was still the case with the Benn publications that demands were very far from being met. It was quite impossible to assess the damage and loss resulting from restrictions on the dissemination of information and knowledge vital to industrialists and traders through the prolongation of the Paper Control and its regulations.

The fact that revenue from advertisements and sales alike touched a new high record in the 69 years' history of the company was a matter for satisfaction; what was equally pleasing was the fact that every branch of the business, without a single exception, had contributed to that achievement.

Price of Paper

During the year, some saving was effected through a small reduction in the average price of paper, but this was heavily offset by the increase in the cost of printing. If printing costs had remained at the same level as in the previous year, the profit of Benn Brothers, Ltd., in 1948/49 would, before tax, have been some £23,000 greater. Expressed in another way, the decrease in profit for the year of £16,000, as shown in the profit and loss account, would have been converted into an increase of £7000.

Taxation absorbed about one-half of the net profit of the company to-day, compared with about one-quarter 10 years ago and one-sixth 20 years ago. Again, averaged over the past two years, taxation had taken each year about two shillings in every £1 gross income, before charging any expenses whatsoever.

In spite of this heavy drain of taxation, over £100,000, excluding the annual sums written off the item "Goodwill and Copyrights," had been added in the last three years to the company's reserves, including the increased amount carried forward.

(*continued at foot of next column*)

NEXT WEEK'S EVENTS

MONDAY, SEPTEMBER 5

Welsh Industries Fair

Cardiff: Drill Hall, Dumfries Place. Daily 12 noon to 8 p.m. (until September 10). Welsh products, including chemicals, electric equipment, paints and varnishes, plastic flooring and walling, etc.

TUESDAY, SEPTEMBER 6

Royal Netherlands Industries Fair

Utrecht: Daily until September 15.

Incorporated Plant Engineers

Cardiff: Grand Hotel, 7.30 p.m. Lecture: "Lubrication," by a technical representative of the Vacuum Oil Co. Film: "The Inside Story."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, 6.30 p.m. Opening of Midlands Centre session. R. C. Davies (new chairman) will read a paper on the history of electrodeposition.

THURSDAY, SEPTEMBER 8

Incorporated Plant Engineers

Newcastle-on-Tyne: Turk's Head Hotel, 7.15 p.m. L. Walmsley: "Materials Handling Equipment."

FRIDAY, SEPTEMBER 9

Aslib

Leamington Spa: Ashorne Hill, 24th annual conference of the Association of Special Libraries and Information Bureaux (including the British Society for International Bibliography), until September 12. The conference will be opened by Dr. Percy Dunsheath, president-elect.

SATURDAY, SEPTEMBER 10

Flanders International Fair

Ghent: Daily, until September 25.

International Levant Fair

Bari: Daily, until September 26.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

H. & G. Place & Co., Ltd., Sale (Ches.). Chemical manufacturers, etc. (M., 3/9/1949.) July 27, debentures, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£3000. July 2, 1948.

Mortgage Satisfactions

Lafarge Aluminous Cement Co., Ltd., London, W. (M.S., 3/9/49.) Satisfaction July 27, of debenture stock registered June 25, 1946, to the extent of £5555.

Marchon Products, Ltd., London, N.W., chemical merchants, etc. (M.S., 3/9/49.) Satisfaction July 28, of three mortgages registered January 13, 1947.

Southern Chemicals, Ltd., Dublin. (M.S., 3/9/49.) Satisfaction July 27, of debentures registered September 19, 1939.

Company News

Dufay-Chromex, Ltd.

Substantial trading losses, £101,223 during the year ended September 30, 1948. and some £50,000 in six months to March 31, 1949, are attributed to difficult export trading conditions and the contraction of purchasing power in this country. Some of the factories are to be closed and their work transferred to the central works at Elstree.

Fisons, Ltd.

Proposals have been disclosed to increase the issued capital by over £5 million to £10.5 million by the issue to shareholders of over £2 million ordinary shares and later £3 million unsecured stock. Current net profits, after tax, are expected to reach £405,000.

Metal Industries, Ltd.

Profit for the year to March 31, before deduction of tax, is £891,542 (£718,173). Ordinary dividend remains 7 per cent.

Increases of Capital

The following increases in capital have been announced: Chipman Chemical Co., Ltd., from £20,000 to £50,000. Happe Products, Ltd., from £10,000 to £15,000. Laporte Chemicals, Ltd., from £1,000,000 to £2,000,000. International Paints, Ltd., from £750,000 to £1,300,000.

New Registrations

Gordon Haywood, Ltd.

Private company. (472,101). Capital £2000. Manufacturers of artificial manures and fertilisers. Solicitors: Wells and Hind, Nottingham.

J. & J. Makin (Metals), Ltd.

Private company. (472,142). Capital £100,000. Objects: To carry out all operations in relation to the manufacture in powdered form of metals and alloys and to the heat and other treatment of metals and alloys, to carry out research and experimental work, etc. Directors: J. R. Makin Pilling and J. Makin Kay. Reg. office: Grosvenor Chambers, 16 Deansgate, Manchester.

Xzit (G.B.), Ltd.

Private company. (472,058). Capital £4000. Objects: To carry on the business of manufacturers, producers of liquid oil treatments consisting of coal tar and mineral solvents combined with metallic soaps, refractory coatings consisting of clays and metal oxides combined in oil to produce heat resisting coatings. Directors: Commander A. L. White, R.N. (retd.), and E. Sworder. Solicitors: Hunters, 9 New Square, Lincoln's Inn, W.C.2.

Licences for Cold Pressure Welding

Arrangements have been made for the issue of non-exclusive user licences to all firms wishing to use the cold pressure welding process (except for certain electrical uses) developed by the General Electric Co., Ltd., at a low royalty rate.

The Stock and Chemical Markets

BUSINESS in stock markets continued to contract as great caution prevailed in anticipation of the Washington talks on Britain's dollar problems. At the time of writing, the view that devaluation of the £ is probable appears to be gaining ground, and as a result British Funds have lost part of their recent rally.

There has, however, been firmness in industrial shares, particularly those of companies whose export business would be stimulated and whose dollar assets in the U.S.A. and Canada would be increased in terms of sterling if the £ sterling were reduced in value in relation to the dollar.

Chemical and kindred shares have been firmer generally, although best levels were not entirely maintained. Imperial Chemical at 43s. 4½d., for instance, have not retained an earlier rally, but Monsanto showed steadiness at 49s. 4½d. Fisons have been more active around 40s. 6d., Albright & Wilson were 27s. 9d., and Brotherton 10s. shares 19s. 9d.

Elsewhere, Amber Chemical 2s. shares were 4s. 3d., and Bowmans Chemicals 6s. 6d. William Blythe shares changed hands around 20s. 6d., and Boake Roberts were 29s. 9d., while Laporte Chemicals stayed at 21s. on the share bonus. The 4s. units of the Distillers Co. have risen to 27s. 1½d. on further consideration of the strength of the balance-sheet and the share bonus.

Triplex Glass (18s.) have been steadier, awaiting the full results and the chairman's annual statement, while United Molasses (38s. 6d.) have been favoured, being among shares of companies which are important dollar earners, as have Turner & Newall at 77s. 6d. British Aluminium were steady at 43s. 3d., and Borax Consolidated have advanced to 54s. 4½d. being again in demand because of the company's important interests in the U.S.

Amalgamated Metal at 18s. failed to hold an earlier gain, although the assumption in the City is that if sterling were devalued, re-opening of the London Metal Exchange would quickly follow. Metal Traders shares have risen further to 47s. 6d. in anticipation of the financial results. British Glues 4s. shares kept firm at 19s. following publication of the report and accounts, while in other directions, General Refractories strengthened to 22s. 9d. German Potash Bonds were inclined to ease after the latest official statement on the negotiations on the question of resuming interest payments.

Iron and steels have been firmer, although movements were again small.

Boots Drug at 49s. 6d. were higher, as were Timothy Whites at 32s. 6d., and Beechams deferred further improved to 13s. 3d. Sangers were 28s., and Griffiths Hughes 18s. British Xylonite firmed up to 71s. 3d., De La Rue have been active round 26s. 3d., British Industrial Plastics 2s. shares were again 4s. 10½d., and Kleeman became steadier at 11s. 1½d. Elsewhere, however, Glaxo eased to 18⅜.

Market Reports

THERE have been no changes of importance on the London chemicals market during the past week. A fair amount of new business has been reported although, due to the easier supply position, consumers, on the whole, tend to cover no more than their nearby requirements. A fairly satisfactory export demand for chemicals has been maintained and values generally show little alteration from recent levels. Quiet conditions continue to prevail on the coal tar products market.

MANCHESTER.—Reasonably active trading conditions have been reported during the past week on the Manchester chemical market. There has been a steady call for textile bleaching, dyeing and finishing chemicals and contract deliveries of these, as well as of most other industrial chemicals, have been well maintained. Fresh inquiries on both home consumption and export accounts have been fairly numerous and have covered a wide range of products. Prices generally have been well held. In superphosphates and certain other sections of the fertiliser market further buying well in advance of actual requirements has been reported. With regard to the by-products, comparatively quiet conditions have been reported again in most sections.

GLASGOW.—Scottish chemical market conditions have been a little more active during the past week, and many prices have continued to show slight decrease as competition becomes much keener. The volume of business being transacted is about average for the time of year, the only noteworthy shortage being carbon tetrachloride, where the position is becoming a little difficult.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Methods of preparing organogermanium halides.—British Thomson-Houston Co., Ltd. April 16, 1946. 626,398.

Trimethyl halogenophenylsilanes. — British Thomson-Houston Co., Ltd. June 14, 1946. 626,515.

Process for preparing halogen-substituted unsaturated organic nitriles.—N.V. De Bataafsche Petroleum Maatschappij. June 28, 1946. 626,516.

Preparation of organohalogenosilanes.—British Thomson-Houston Co., Ltd. June 28, 1946. 626,519.

Manufacture of intermediates in the synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14, 1945. 626,523.

Production of vinyl naphthalene.—Koppers Co., Inc. July 13, 1945. 626,362.

Production of methyl naphthyl carbinol. —Koppers Co., Inc. July 13, 1945. 626,363.

Controlling the composition of steel alloys during the manufacture thereof.—A. H. Stevens. (E. D. Bransome.). Dec. 30, 1942. 626,604.

Methods of finishing textile materials, and textile materials, fabrics or yarns resulting therefrom.—Monsanto Chemical Co. July 26, 1944. 626,847.

Surface treatment of aluminium and aluminium base alloys.—H. R. Watson, and A. T. Ward. Oct. 23, 1945. 626,693.

Production of powder or sponge of metals or metal alloys by electrolytic reduction of metal oxides or other reducible metal compounds.—E. H. E. Johansson. Jan. 5, 1945. 626,636.

Colloid materials.—E. I. Du Pont de Nemours & Co. April 26, 1945. 626,954.

Device for granulating molten chemicals.—Spolek Pro Chemickou A. Hutni Vyrobu, Narodni Podnik. Sept. 24, 1941. 626,948.

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Methods of preparing an artificial resin and the artificial resin resulting therefrom. —Quaker Oats Co. April 4, 1945. 626,645.

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Apparatus for use in carrying out chemical reactions.—Anglo-Iranian Oil Co., Ltd., and R. O. Judd. Aug. 14, 1946. 626,866.

Process for the preparation of a mixture of nucleotides containing a predominantly adenosintriphosphate.—A. E. Szent-Gyorgyi. Aug. 14, 1944. 626,711.

Preparation of crotonic acid derivatives and of phenanthrene derivatives therefrom.—Organon Laboratories, Ltd., and W. C. J. Ross. Aug. 14, 1946. 626,712.

Method of introducing an amino group into the nucleus of an aromatic compound.—J. S. F. Turski. Sept. 2, 1946. 626,661.

Removal of fluorine from acid nitrate-containing solutions.—Directie Van de Staatsmijnen in Limburg. June 5, 1942. 626,662.

Manufacture of N-alkyl or N-aralkyl derivatives of oxazolidine-2: 4-diones.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. Sept. 16, 1946. 626,971.

Preparation of 1, 2-disubstituted-3-cyanoguanidines.—American Cyanamid Co. Sept. 22, 1945. 626,663.

Reaction chamber for the temperature control of endothermic and exothermic chemical reactions.—J. C. Arnold. (Standard Oil Development Co.). Sept. 18, 1946. 626,664.

Production of dispersions of synthetic resins.—British Cellophane, Ltd., W. Berry, and C. R. Oswin. Sept. 25, 1946. 626,876.

Process of refining intensively cracked gas oil, and producing heating oil and polymerised products therefrom.—C. Arnold. (Standard Oil Development Co.). Oct. 2, 1946. 626,877.

Separation of gases at low temperature. —Petrocarbon, Ltd., and A. A. Aicher. Dec. 3, 1946. 626,894.

Granular smokeless propellant powders. —I.C.I., Ltd., S. Gordon, and E. Whitworth. Dec. 20, 1946. 626,955.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21, 1946. 626,909.

Manufacture of disazo-dyestuffs.—Ciba, Ltd. Jan. 31, 1946. 626,916.

Materials containing polyvinyl derivatives.—Soc. Rhodiaceta. May 3, 1945. 626,988.

Catalytic synthesis of hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.). Feb. 14, 1947. 626,742.

Production of water gas from solid carbonaceous materials.—J. C. Arnold. (Standard Oil Development Co.) Feb. 14, 1947. 626,743.

Method of producing shaped bodies from powdery aluminium.—American Electro Metal Corporation April 16, 1946. 626,764.

Process for preparing unsaturated acid halides.—N.V. De Bataafsche Petroleum Maatschappij. June 15, 1946. 626,772.

Preparation of rubber hydrochloride.—Frenkel's Machines (Great Britain), Ltd., B. Frenkel. and L. Mitlin. April 17. 1947. 626,778.

Manufacture of the higher fatty acid esters of poly-chlorinated phenols.—E. B. Higgins. Sept. 2, 1947. 626,824.

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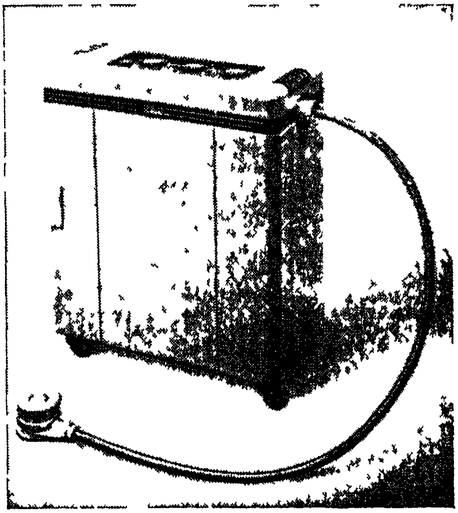

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The Seaweed Source of Chemicals

THE considerable value of seaweed as a source of a wealth of pharmacological, chemical and industrial extracts of high value is an established fact, to which several recent authoritative publications have added a useful technical commentary. The conclusion which must be drawn from all the evidence which has lately come to hand is that there is around these coasts, and especially on the Western seaboard, a great source of useful materials offering a potential return valuable enough to ensure that the serious technical problems of recovery will ultimately be overcome.

That stage has not yet been reached. Evidence of that is given indirectly in last week's official publication, "A Study of British Seaweeds,"* and perhaps rather more pointedly by the information lately released by the Scottish Seaweed Research Association, whose record in the commercial exploitation of algæ bears witness to a very vigorous approach which has begun to yield some substantial commercial rewards.

The official review, sponsored by the Ministry of Health and the Ministry of Supply, bears the hall marks of a closely integrated and planned approach to the problems of making seaweed serve as a chemical raw material. Quite rightly, it does not seek short cuts or spare any detail which may be of value to other workers in the same field; in addition, it supplies, for the first time at full length, an account of the first serious work to make British seaweed a source of agar. That began when war deprived this country of the Japanese supply and simultaneously made agar more necessary than ever before for bacteriological work. Agar had to be procured quickly in relatively large quantities and the official research team secured that result. Much of the work which is now described was part of that project, the urgency of which did not deter the volunteer team—of which S. M. Marshall, Professor Lily Newton and H. P. Orr were the principals—from making a meticulously detailed and painstaking survey of the character and distribution of algal supplies and of some chemical treatments. Inevitably, however, this research does not survey all the possibilities and emphasis in nearly all the chapters is upon the red seaweeds *Gigartina Stellata* Batt. and *Chondrus Crispus* (L) Stackh., which preliminary surveys indicated to be the most readily procured of the varieties

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* "A Study of Certain British Seaweeds and their Utilisation in the Preparation of Agar," by S. M. Marshall, L. Newton and A. P. Orr. (H.M.S.O. 27s. 6d. net.)

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from which suitable agar can be produced. The field was narrowed with the course of further work by the discovery that Chondrus was relatively harder to procure, so that the principal interest in the published result centres round Gigartina. So far as that species is concerned, "A Study of Certain British Seaweeds" richly deserves to be accepted as the standard work for those concerned chiefly with agar.

This survey, revealing as it is, is prone, however, to obscure from view some very much wider prospects afforded by other seaweeds and other uses. The foremost authority in these other departments now is the Scottish Seaweed Research Association, which represents the outcome of a most promising kind of collaboration by Government departments and Scottish industrial interests. Having objectives far less specialised than that of the authors of the official report, the Scottish association seems to have travelled very much further towards the fuller exploitation of marine algæ. It has inherited the results of the war-time work and has added an ample contribution of its own, concerned with the brown seaweeds occurring abundantly in Scottish waters. That policy promises to represent the entire prospect in relation to seaweed in a much wider and more promising context. To supply all our own needs of agar alone is a sufficiently desirable objective, economically and strategically, but the Scottish research seems to indicate clearly a good prospect of yielding in bulk the source of protein, carbohydrates and many extracts.

Equally promising is the evidence of continuing sources of suitable seaweed yielded by the association's surveys, showing, for example, that round Orkney alone some 1.2 million tons of sub-littoral weed grows in easily accessible waters from 1 to 6 fathoms, a density of 20 tons per acre. The novel problems of harvesting so unusual a crop seem now to be much more of an impediment than the technology of converting the various algæ into industrial materials. Basically the latter is far simpler than that of many common chemicals. The immediate responsibility now appears to rest upon the engineers, to offer a practicable and inexpensive method of cutting and recovery. The size of the benefits to be had suggest that they will not fail to supply the means.

Notes and Comments

Shadow of Overproduction

THE knowledge that few world markets for primary industrial materials, such as chemicals, could re-form in precisely the same shape as they presented before the war has been underlined repeatedly since 1946. Reports since then of large production schemes by consumer countries, to relieve their pressing shortages of essentials which imports formerly provided in ample quantities, have foreshadowed big changes in the old ratio of supply and demand and the evident possibility of temporary over-production. In the report which the Chemical Products Committee of OEEC has just published the seriously unbalanced ratio between production proposed in the co-operating countries in 1952 and estimated needs stands out conspicuously. Summarising the estimates disclosed by the majority of countries, this indicates the possibility that by 1952-53 nitrogen fertilisers may be produced at an annual rate of 2,187,000 metric tons of pure nitrogen, demand for which is not expected to exceed 1,867,900 metric tons, and production and use of soluble phosphates may be, respectively, 3,314,000 and 2,847,500 metric tons. France, Italy and the Benelux countries are shown as the potential sources of the great productive increases and, excepting France, have based their proposals on the prospect of largely increased overseas sales. In uncertain trading conditions, that outlet may never fully materialise, and the Chemical Products Committee does not conceal the fact that prudent adjustment of plans for new capacity is urgently called for. That warning seems to apply with even more force to the international programmes for plastics raw materials and dyestuffs, of which the proposed rise in production is proportionately much larger.

German Objectives

THE first issue of the revived *Chemische Industrie* (July), before the war one of Germany's leading trade and technical publications, dating back about 60 years, is of exceptional interest for several reasons—political, economic, and technical. The printing and general get-up are excellent, and the quality of the paper does not suggest any austerity. The post-war objectives of *Chemische Industrie,* described in a prefatory note, are of a kind to appeal to everyone: to give a full and accurate picture of German chemical industry to all, at home and overseas; to promote better understanding among the nations, so far as this is possible by frank discussion of mutual economic interests in chemical industry, as some contribution towards peaceful work throughout the world. That ideal is unquestionably sincere, yet there are already indications that, under present conditions in Germany, the disinterested standpoint is not easily preserved. One is reminded of this in the course of the economic reviews of German chemical industry by W. A. Menne, president of Arbeitsgemeinschaft Chemische Industrie, which discloses something of the bitterness of spirit which the spectacle of a great industry in adversity has engendered in some Germans, while at the same time hardening their determination to persevere against all difficulties. It is not to be expected that German writers should give much thought at this stage to the bitter seeds of a past decade of which the present hardships are the fruit. Discussing all such considerations, one writer at least is able to present an imposing indictment of some aspects of the dismantling policy and especially of the indiscriminating ban on the Fischer-Tropsch plants and processes, and the virtual exclusion of German chemists from the potent field of catalysis in a department in which they were pioneers. The salvaging of at least specialised and " inoffensive " sections of the F-T plant is evidently high in the list of German chemical objectives.

Atomic Safety Measures

ONE tangible benefit accruing from the agreement of the U.K., Canada and the U.S.A. to pool certain scientific and technical knowledge of atomic energy has been a series of meetings this week at the atomic energy research establishment at Harwell, Berkshire, at which specialists of the three countries have compared experiences of hazards and safety measures. The disposal of radioactive wastes remains one of the fundamental problems which would complicate the operation on a large scale of the chain reactors which may be set up in the future, if nothing better than the present laborious screening has been devised. At present some of these highly energised unwanted materials are enveloped in concrete " coffins " and given a sea burial, remotely and at a depth which should ensure that they do not emulate the disconcerting habits of " rogue " sea mines. This and the elimination of radioactivity from the vast flow of cooling water required in operating piles must be problems common to America's Atomic Energy Commission and the Chalk River project, each of which is represented by several principal scientists at Harwell now, notably Dr. Edward Teller, of the AEC, and Dr. W. B. Lewis, director of Chalk River Laboratory. The British contributors to the talks include Dr. H. W. B. Skinner and six other specialists at Harwell and three members of the Department of Atomic Energy (Production).

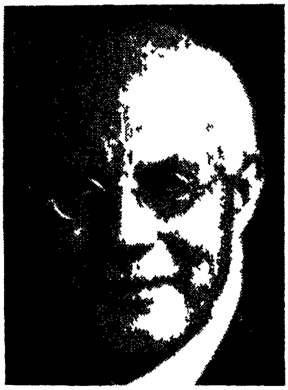
Clearing the Air

BELATEDLY there has been published (under date of September 1) a report on observations made in the five years ended March 31, 1944, by the Atmospheric Pollution Research Committee of the DSIR, which works with the aid of the standing conference of co-operating bodies from which most of the local information is derived. The data published serve to underline the rule that the invisible pollution of the atmosphere by sulphur gases is almost directly proportional to the quantity of coal burned, irrespective of the size or type of the combustion appliance used. This seems to be a direct pointer to the need—which has been so often stressed—for the treatment of a larger proportion of coal at or near its source. This aspect of the problem, and the possibility of the fuel treatment being made economically more attractive by the recovery of by-products is, however, not one of the concerns of the present report, which confines itself mainly to a description of the various known methods of measurement of atmospheric pollution and a comparison of the yield obtained. One of the interesting features given in graph form is the series of fluctuations in sulphur-dioxide measurements (by the lead-peroxide method) at a group of 20 stations during 1935-1944. The readings of sulphation—mg. of sulphur-dioxide/day/100 cm^2—taken, for example, at City Hall, Cardiff, during this period, range between 0.5 and 2 mg., compared with readings at London (County Hall laboratory roof), from 0.75 to 12. London, in that respect, is at times a good deal more sulphurous than Leicester (1 to 7) or Huddersfield (1 to 4.5). The predominant responsibility of industries for the sulphur shower is reflected in the fact that from the middle of 1939 until the time of Dunkirk (when normal industries were slack) there was a corresponding fall in sulphur pollution. After Dunkirk, there was a marked and rapid increase in the consumption of coal in furthering wartime production—with the immediate result in the atmosphere of a corresponding rise in sulphur-dioxide. The report concludes on the note that, prewar standards having been so far short of perfection, and a number of years having since gone by without any major attempts at improvement, the present rebuilding and general reconstruction offer opportunities, which must not be missed, of improving the state of the country's atmosphere.

Contemporary Tasks for Scientists

British Association Specialists and Immediate Needs

This year's president, Sir John Russell, FRS (left), who, like his predecessor, Sir Henry Tizard, has again shown how vast and varied is the task of scientists to safeguard the basis of all human advancement—adequate nutrition. The next presidents were announced to be Sir Harold Hartley (right) and the Duke of Edinburgh (1951)



Sir Harold Hartley was appointed president of the British Association for the Advancement of Science for 1950 at the annual meetings in Newcastle-on-Tyne last week. Sir Harold Hartley, a Fellow of the Royal Society, was natural science tutor and Bedford Lecturer in physical chemistry from 1901 to 1931 and has published a number of papers on chemistry and industrial research. During the 1914-18 war he was chemical adviser to the 3rd Army, assistant director, Gas Services, and controller, Chemical Warfare Department. In the last war he was scientific adviser to Mr. Geoffrey Lloyd at the Petroleum Warfare Department in the development of FIDO. From 1932-47 he was chairman of the Fuel Research Board and has been chairman of the British National Committee and International Executive Council of the World Power Conference since 1935.

The Duke of Edinburgh has consented to be president of the British Association in 1951, the year of the Festival of Britain, when the association will hold its meeting in Edinburgh.

Common Needs

The week's meetings, which concluded last Wednesday, have revealed once again the association's very practical preoccupation with the scientific approach to the relief of immediate problems, national and of world wide distribution. That devotion to human affairs determined in advance the theme of the presidential address by Sir John Russell—of enlarging food supplies, with all scientific improvements of conventional methods, on a scale to match the continued rise in world populations. He did not disguise the fact that science and agricultural technology alone could prove unequal to the task if birth rates in some Eastern territories continued to soar.

The same concern was evident in the papers of several other authoritative contributors and notably in Sir David Rivett's warning that Australia was far from being an inexhaustible storehouse of foodstuffs.

Coal and Chemicals

The chemist's view of the coal industry was expressed by **Dr. I. G. C. Dryden** in the discussion at a joint meeting of the chemistry, geology and economics sections. He suggested that future policy should include research directed towards new chemical industries. He also foresaw the ultimate need that a proportion of miners should be so trained that they could be transferred between coal production and chemical processing as required. This would help to balance supply and demand for coal and assist in maintaining cheap fuel and price flexibility.

Prof. A. Beacham, speaking on the same subject, dealt with the problems faced by the Coal Board under the nationalisation Act. Emphasis, he said, was placed on output expansion, but the danger was that if production was so increased as to make it difficult or impossible to sell high-priced coal, adjustment might need to be severe.

Much greater co-operation between the Government and industrial laboratories was urged by SIR ARTHUR P. FLEMING in his presidential address to the engineering section on "Bridging the Gap Between Science and Industry." The demand for scientists and technologists in this country exceeded the supply, while the maintenance of industrial efficiency depended increasingly on scientific staffs. The importance of reducing the time lag between the discovery of a new idea and its ultimate conversion into a usable product could not be overestimated. Industrialists in the U.S.A. excelled in the speed with which they carried into effect any new project, and the value of time in making a fresh idea marketable seemed to be more acutely realised there than in this country.

Using Fission Products

In the field of nuclear physics, Sir Arthur Fleming said he thought that greater benefit would accrue to the U.S.A. from the discoveries made in this science, as a larger number of scientists were gaining experience in its practical application and would be able to turn any discoveries to practical account.

SIR HENRY TIZARD agreed that the quicker application of science to industry was essential or this country would cease to count among the great nations. He affirmed, however, that, whatever might be the cause of the delay, the quality of our fundamental research was unsurpassed. He considered that it would be many decades before nuclear energy would be of any material advantage to industry.

Enzymes and Fluorides

Accurate understanding of the chemistry of the living substance was the most powerful approach to rational control, stated PROFESSOR R. A. PETERS in his presidential address to the physiology section. He showed how an attempt to analyse the pharmacological action upon tissue cells of two very simple molecular substances (iodoacetic and fluoracetic acids) led to an application of recent biochemical research upon organised enzyme systems, indicating a central enzymic mechanism in cells.

Recent advances in the chemistry of certain inorganic fluorine compounds were discussed by PROFESSOR H. J. EMELEUS, who dealt with the progress that has been made in elucidating the structure of chlorine trifluoride, bromide trifluoride, and iodine pentafluoride.

PROFESSOR M. STACEY gave a survey of the methods available for the introduction of fluorine into organic compounds. He also gave an account of the fluorine-containing compounds now available, their unusual properties, and gave an estimation of their future uses.

In the section on "Chemistry and the Food Supply," MR. D. D. OGILVIE said that the chemical approach to problems of animal health was of outstanding importance. Most of the chemical effort in the past had been devoted to curing of disease; in future, more attention must be devoted to maintaining animal health. MR. L. W. L. COLE dealt with chemicals and insect control, and DR. H. S. HIRST, in "Chemicals and Grass Conservation," referred to recent progress in the chemistry of bacterial fermentation.

More Scientists Essential

A plea for scientific help in developing the resources of Australia was made by SIR DAVID RIVETT, who in 1946 was appointed chairman of the Commonwealth Council for Scientific and Industrial Research.

He affirmed that it was to scientists, working with all the aid that can be made available, that Australia must look for help. Britain's aid to such development was essential. While it was appreciated that demands on British science were very great, Sir David Rivett appealed for more team spirit to enable Australia to pull its weight in the crucial 20 years lying ahead.

U.S. Tin Proposals

UNCERTAINTY regarding future tin supplies and the effect of recent price rises are reflected in a recommendation sponsored jointly by the U.S. Senate and the House of Representatives that the Department of the Interior should stimulate the exploitation and use of American tin sources. Among the recommendations it is proposed that the U.S. Government shall give preference to domestic producers and that generally the recovery of tin from home ores and concentrates shall be given preference over smelting of imported ores.

Electronic Research

Murphy Radio, Ltd., announces an increase in its capital for the acquisition of two interests in the electro-medical field, General Radiological, Ltd., and Solus-Schall, Ltd. The acquisition marks a further step in the company's expanding research and development work in electronic fields.

THE PROPAGATION OF FLAME

Studies of Shadow Cones and Bubble Effects

AMONG the more factual technical studies contributed in the chemistry section at the British Association's meetings last week was a discussion on the propagation of flame and measurement of flame speeds by DR. J. W. LINNETT, which followed the presidential address of SIR ALFRED EGERTON ("The Study of Reaction Kinetics," THE CHEMICAL AGE, *61*, 313).

Removing all doubt about the utility of this department of research, Dr. Linnett reminded the assembly that, although flames have been investigated for centuries our knowledge of how a flame travels through an explosive gas mixture is still uncertain. The two extreme possibilities are that (a) active atoms and radicals diffuse ahead of the flame causing the next layer to react, (b) the heat of reaction is conducted ahead so that the next layer is heated sufficiently to react violently. Probably the real situation lies between these extremes and both (a) and (b) are simultaneously important, though their relative importance may vary from case to case.

Speeds Measured

Any theory of flame propagation must be able to account for its speed of travel and how this is affected by changing conditions (pressure, inert bases, etc.). We have therefore started to measure a number of fundamental flame speeds in order to find a little more about how flames get along, reported Dr. Linnett.

We have used two methods: (i) The burner method, in which the shape of the Bunsen cone is determined. (ii) The soap-bubble method. A 3-in. soap bubble is filled with explosive gas. It is then sparked at the centre and the resulting explosion photographed by a rotating drum camera. Flames travelling across the bubble at speeds up to 4500 cm./sec., or 100 m.p.h., have been measured. Allowance is made for gas movement by determining the degree of expansion on explosion.

If a direct shadow or Schlieren shadow picture of a Bunsen cone is taken there is a sharp-edged cone on the shadow picture. Comparison with a direct photograph shows that the shadow cone is inside the visible cone. If illuminated dust particles are used to show up the flow lines it is found that the gas flow has changed direction before the visible cone is reached, indicating that, by that stage, considerable expansion has occurred. The emission of light is therefore late in the sequence of events that constitute a flame.

We have therefore used the shadow cone to indicate the flame front and have employed this rather than the visible cone to determine flame velocities. We have studied ethylene-air flames to which N_2 and CO_2 have been added, examining also the effect of pressure on ethylene-air flames. The flame velocity increases from ca. 70 to ca. 110 cm. per sec. on passing from one atmosphere down to about a fifth of an atmosphere.

Gas Mixtures

In the soap-bubble method we have used the light emitted by the flame to photograph its movement. We have studied mixtures of ethylene and oxygen with added argon, nitrogen, helium and carbon dioxide, obtaining results for pressures between a sixth and one atmosphere. At low pressures the soap bubble is blown with a supply of the explosive gas inside an old Admiralty mine-case, 3 to 4 ft. in diameter, fitted with thick perspex windows. The mine-case can be evacuated.

For acetylene-air and acetylene-oxygen-argon flames, the flame velocity is constant from one down to a third or a quarter of an atmosphere and then decreases (in contrast with ethylene). At atmospheric pressure a 10 per cent acetylene-air mixture burns with a fundamental flame velocity of 150 cm. per sec.

Retarding Effect of CO_2

If the nitrogen is replaced by argon the flame velocity is 220 cm. per sec., and if replaced by helium, carbon dioxide or oxygen 335, 40 or 340 respectively. The smaller heat capacity of argon relative to nitrogen shows itself in the increased flame velocity.

The effect of the small and light helium atoms relative to those of argon is also apparent. The velocity with carbon dioxide present is surprisingly small. Perhaps it exerts chemical as well as physical effects.

We shall extend these results and hope that we can unravel some of the factors affecting the propagation of flame.

COMBUSTION OF COLLOIDAL POWDERS

French and American Test Methods and Effects

UNTIL approximately the last decade, the rate of combustion of colloidal powders has been determined by the Vieille method, *i.e.*, burning to powder in a steel bomb fitted with a special recording device for indicating pressure development as a function of time. In order to deduce from the pressure/time curve the speed of combustion, it is necessary to adopt Vieille's hypothesis and admit also that cooling on the walls of the bomb is at any moment proportional to pressure.

H. Maraour (*Chim. et Ind.*, 1949, *62*, (7), 22-25), recalling his own earlier work in this field, states that he had then shown that the logarithm of combustion speed is a linear function of absolute temperature T of gas evolved by the powder, and therefore Vieille's hypothesis implied also this further assumption that T is independent of pressure.

Gas Effects

If it is admitted that thermodynamic equilibrium is attained in combustion products, this second hypothesis is acceptable, at least for normal colloidal powders, with T about 2500-3000° C., since the composition of the gaseous mixture evolved is determined solely by water/gas equilibrium: $C. + H_2O \rightarrow CO_2 + H_2$ independently of pressure. This does not hold for very hot powders, when there is further dissociation, namely, of CO_2 and H_2O, a dissociation limited, however, by pressure.

On the other hand, in the very incomplete combustion of relatively cold powders, methane is formed and raises the temperature of gases evolved. The author has previously shown that with such powders the rates of combustion under high pressure of about 4000 kg./cm.^{2} are higher than those calculated on assumed absence of methane (*Chim. et Ind.*, 1943, *50*, 168). The thermodynamic equilibrium assumption may in such case be debated. In any case it is known that, at very low pressures—below 50 kg./cm.^{2}—the presence of NO may be observed, the amount thereof being particularly marked under ordinary pressure. Muraour suggests that combustion may take place in three phases (*Comptes Rendus*, 1947, *225*, 381; 1949, *228*, 318):—

In the first phase, all the nitric acid of the powder is set free as NO, with considerable formation of CO and H_2 and deposition of C. Temperature is low and nearly the same for all the powders (1700° C.).

The NO, in the second phase, reacts with CO and H_2 with formation of CO_2 and H_2O, the free carbon being slightly or not at all affected. Temperature is very high, and may be 1000° C. above that of the third phase. In this the free carbon reacts with CO_2 and H_2O, the gas volume increases, temperature falls, and thermodynamic equilibrium is reached.

If the first phase only applies under very low pressures it appears that the second plays a part under slightly higher pressures, the equilibrium of the third phase being only attained under high pressure, *e.g.*, of 500-1000 kg./cm.^{2}. It thus appears that objection can be raised against Vieille's hypothesis only in the case of low pressures. This point has become of special importance now that powders are no longer used solely in guns under high pressures of 2000 kg./cm.^{2} and over, but also under low pressures in fuses, *i.e.*, about 50-300 kg./cm.^{2}.

Temperature and Pressure

In earlier work the author, with G. Aunis (*Chim. et Ind.*, 1942, *47*, 602; *48*, No. 1, 11), has investigated the law governing the speed of combustion as a function of pressure, with different types of powder, and determined the form and area of the pressure/time curve. If speed of combustion is simply proportional to pressure, namely $V = bP$, the area would be constant under all charge densities. Experiment has shown that this is not so, and that the equation should read $V = a + bP$, wherein log. b is a linear function of temperature of gases evolved. The value of a varied in these experiments between 8 and 11 mm./sec. (combustion on both sides of powder). Thus, with a normal powder SD, we may have V in mm./sec. = 10 + 0.100 P.

This method, however, like that of Vieille, is still indirect, and it would be of considerable interest to have a direct method, such as that already described by the author (*Chim. et Ind.*, 1942, *47*, 476; 1943, *50*, 172). The method is based on the fact established by experiment that the speed of combustion depends on

(*continued on page 350*)

UTILISATION OF MARINE ALGAE

Effective Harvesting Remains the Chief Problem

by MAJ. PHILIP JACKSON, M.I.Mech.E., M.I.Chem.E.*

SEAWEEDS can be divided into four main groups according to their characteristic colours, red, green, brown and blue.

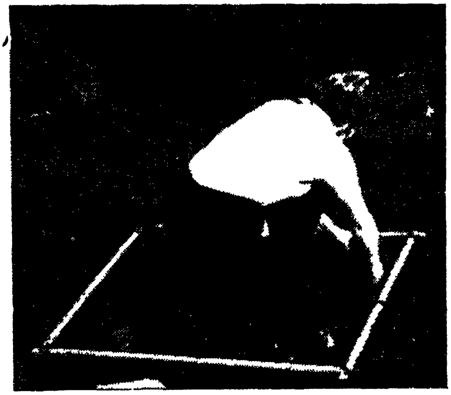
Certain red seaweeds form a source of agar, the uses of which as a culture medium in bacteriological investigations and in the fish canning and other industries, are well known. Before 1939 the bulk of the world's agar supplies came from Japan, and with the entry of that country into the second World War, the supply position became acute. As a result, investigations were initiated in Britain, as in many other countries, to examine the possibility of a local source of supply.

From the point of view of commercial utilisation, the *brown* seaweeds common to Scottish waters are conveniently subdivided into inter-tidal or littoral seaweeds, which are exposed at low tide (*cf. Fucaceae spp.*), totally submerged or sub-littoral seaweeds (*cf. Laminariaceae spp.*), and cast weeds or seaweeds in the second sub-classification which have been dislodged from the seabed by storms and cast on to the beaches.

Basic Materials

Previous attempts to exploit the brown seaweeds commercially as a source of soda, potash, and iodine, failed with the discovery of cheaper sources of these inorganic materials. The investigations commenced in recent years by the Scottish Seaweed Research Association, however, aimed at utilising the organic constituents, carbohydrates, proteins and the like, which to-day find wide application in all the major industrial countries in the world and on which it is fairly certain that a permanent and thriving seaweed industry can be based.

So far, alginic acid is the only organic constituent being used commercially on a large scale. While the acid itself is used in the manufacture of fibres, thickeners, protective colloids, insulating materials, etc., its real importance lies in the fact that it is the starting point for the production of alginates, which are used extensively in the food, textiles and paper industries, and in the manufacture of pharmaceutical, medical and surgical preparations.



Locating the suitable seaweeds in adequate quantities is one of the formidable essentials. Here the littoral weed beds are being estimated by reference to typical sample areas from which the weed is cut, weighed and studied

Mannitol, another important organic constituent, is used as an inert filler in foodstuffs, as a dusting powder for chewing gum, in the manufacture of varnishes, coatings for fancy papers and leathers, shoe polishes, soldering fluxes, pharmaceutical products such as metal complexes and colloidal suspensions, and so on.

Laminarin and fucoidin are yet to be fully investigated, but it is fairly certain that new uses for these constituents will be developed when they become available in commercial quantities.

Mapping Growths

A suitable technique for surveying littoral seaweed beds quantitatively has been developed and successfully applied to the Scottish coasts, which have been found to support 180,000 tons of this type of weed growing at a density suitable for commercial exploitation. The technique used, which has been fully described by Walker (*Proc. Linn. Soc.*, 1947, *159*, 90), briefly consists of dividing the coastal areas into sections determined by changes in width, substratum, weed density, species, etc., and determining the average density in each section by cutting and weighing the weed within chosen quadrats.

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* Deputy Director of the Scottish Seaweed Research Assn., in a paper presented before the United Nations scientific conference on the conservation and utilisation of world resources.

The quantitative assessment of the totally submerged or sub-littoral seaweeds is more difficult. Aerial photographs are useful only to give a preliminary, and largely indirect indication of the presence or absence of weed in the sub-littoral zone, and even for this limited use considerable experience is necessary before the results can be interpreted with confidence. The " View Box—Spring Grab " technique (Walker, *J. Eccol*, 1947, *35*, 166), though somewhat laborious and time consuming, gives all the information required with a reasonable degree of accuracy. This method, which is applied after an area has been selected from a study of Admiralty charts, aerial photographs, and the general nature of the coastline, consists briefly of first observing the seabed through a view box fitted to the side of a boat to obtain an indication of whether or not a quantitative assessment would be worth while.

90,000 Acres Surveyed

It has since been found that sampling along transects at measured depths can be replaced by random sampling with little if any, loss of accuracy, and a considerable time saving. A specially designed spring grab which closes automatically by a trip mechanism as soon as it hits the seabed and collects all the weed growing within the ½ sq. yd. which it covers, is used in the sampling operations.

During the past two years, the original technique has been applied to a survey of sub-littoral seaweeds growing in Orkney waters. Of the 180,000 acres of seabed between 0 and 10 fathoms around the Islands of Orkney, 90,000 acres were originally estimated to be worthy of consideration as potential sub-littoral seaweed beds. Of this 90,000 acres, preliminary surveys eliminated 50,000 acres as unworthy of more detailed survey or too dangerous for the application of the " View Box—Spring Grab " technique. The remaining 40,000 acres have been surveyed in detail using a motor boat and a crew of three.

From the results of this survey, it has been possible to estimate that the sub-littoral seaweed resources of Orkney in areas where harvesting would be profitable, amount to 1.2 million tons, growing at a density of 20 tons/acre, mainly between 1 and 6 fathoms.

Large quantities of sub-littoral seaweeds are dislodged from the seabed by winter storms and cast on to the beaches each year. Two factors must be taken into account in any scheme to utilise this weed. First, if it is not removed quickly, there is a considerable risk of its being reclaimed by the tide; and second, if left in the " packed " state in which it has been cast, it is susceptible to bacterial attack. If economic means of overcoming these difficulties can be devised, cast weed would undoubtedly form a very valuable source of raw material.

Partly for this reason, and partly to obtain information on the location of sub-littoral seaweed beds, about 30 beaches in Scotland and the Outer Hebrides were kept under observation during the winters of 1945-46 and 1946-47. During each of these two winters about 100,000 tons of seaweed were cast, but little is yet known about the conditions of " casting." This is a profitable subject for further investigation.

Suitable methods for the routine estimation of the main organic constituents of the common Scottish brown seaweeds have been developed (Cameron, Ross and Percival, *J.S.C.I.*, 1948, *67*, 161-164, and Percival, Ross, *ibid.*, 420). Two methods have been developed for the quantitative estimation of mannitol, the first based on the quantitative extraction by a suitable solvent such as n-butanol, and the second involving the use of periodic acid.

The extraction method is, however, unsuitable for routine analysis since at least four extractions of 10-12 hours are necessary. The periodic method is based on the fact that 92 per cent of the mannitol is oxidised in 60 seconds, while the other oxidisable constituents are unaffected.

Separating Alginic Acid

The estimation of alginic acid is based on the extraction of the acid from the seaweed with sodium carbonate solution, the seaweed having been previously treated with dilute mineral acid. The sodium alginate so obtained is then converted into calcium alginate, followed by acidification to give the free acid, which is estimated by determining the amount of acetic acid liberated from a calcium acetate solution.

Laminarin is hydrolysed to glucose, which is then estimated with the Shaffer-Somogyi reagent.

Fucoidin is estimated by hydrolysis to fucose, which is oxidised by periodate, and the liberated acetaldehyde determined by the method of Nicolet and Shinn.

Using these methods the chemical composition and variations in composition with age, season, and depth of immersion of some of the sub-littoral seaweeds common in Scotland have been determined

(Black, *J.S.C.I.*, 1948, *67*, 165-176). Monthly samples of *Laminaria Cloustoni, L. digitata, L. saccharina, and Sacchoriza bulbosa* have been collected for a period of two years, the plants divided into stipe and frond and analysed separately for total ash, organic nitrogen, iodine, mannitol, laminarin and alginic acid. The results indicate wide seasonal variations in composition which are due almost entirely to variations in the composition of the fronds.

The seasonal variation of the above constituents in the common littoral seaweed *Ascophyllum nodosum* over a period of two years, has also been studied (Black, *J.S.C.I.*, 1948, *67*, 355-357).

Algal celluloses have been prepared from *Laminaria Cloustoni, L. Digitata*, and *Fucus vesiculosus* and have been shown to be fundamentally similar to the cellulose of the land plants (Percival and Ross, *Nature*, 1948, *162*, 895).

In the extraction of alginic acid on a commercial scale, the remaining organic constituents of the weed are being wasted. This means that for every ton of alginic acid produced approximately three tons of potentially useful chemicals are at present being lost. Processes for the extraction of these chemicals are being investigated.

Cutting Methods

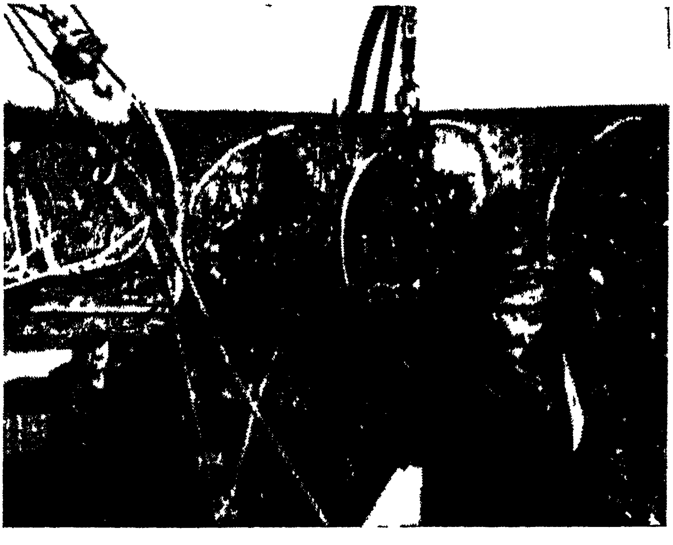
In the first attempt to harvest sub-littoral seaweed mechanically (Mackenzie, *The Engineer*, 1947, October 10, 17, 24), the weed was cut by rotating cutters driven by under-water oil motors. The cut weed was entrained in water pumped from the vicinity of the cutters to conveyors on the deck of the surface craft, the water then being returned to the sea and the weed conveyed to the hold tanks.

Examination of the system has revealed serious faults which must be investigated before this principle can be developed as a practicable method of harvesting sub-littoral seaweed.

Grapnel and Winch

The use of specially designed grapnels for harvesting sub-littoral seaweed from motor boats has been developed with the primary object of providing a simple method requiring inexpensive equipment for use by crofters and fishermen in part-time employment. In trials using a single grapnel and hand operated winch, a rate of over one ton an hour has been achieved, which brings the method within reasonable reach of commercial exploitation. Experiments to date have indicated that the weight of weed harvested in a given time increases, although at a diminishing rate, with the size of grapnel, the latter being limited only by the maximum weight that can be conveniently handled.

Further improvement is anticipated from tests at present being conducted with grapnels of a modified form which will traverse a track of greater breadth on the seabed. In actual harvesting operations two or more grapnels with power operated winches would be used and the weight of weed collected correspondingly increased.



More difficult but offering heavier returns is the cutting and raising of the sub-littoral weed from small craft such as this, a technique which must still be improved if continuing supplies are to be provided for large industries. (The illustrations of this article come from the Central Office of Information film No. 36 "This is Britain")

Spanish Use of Seaweeds

Limited Employment of Rich Growths

IN Spain, as in other maritime countries, increasing attention is being directed to the industrial possibilities of the extensive banks of seaweed along various parts of the coast. F. Cabrera Gomez has recently described the different species that are most plentiful, in connection with a fairly comprehensive literature review of seaweed research to date. (*ION*, 1948, pp. 709-718).

There are several species of both the Fucaceae and Laminaraceae families, the former including *F. vesiculosus*, *F. platycarpus*, and *F. serratus;* also to a less extent *F. nodosus*. Among the principal Spanish Laminaraceae are *L. flexicaulis*, *L. cloustonii*, and *L. saccharina*, with one or two others. The botanical characters of both families are briefly noted.

Seaweed in Spain, as elsewhere, has for a long time been used as manure, and on a small scale for other purposes. Work in other countries in this field, including more particularly in that of alginic acid, is reviewed. The author describes his method for obtaining alginic acid which appears to follow the usual lines: the dry powdered material is several times extracted in weak acid baths, yielding a mixture of alginic acid and cellulose, which is neutralised, washed, and filtered and possibly carbon bleached. The algin or alginic acid is precipitated by hydrochloric and phosphoric acids, and the precipitate dried *in vacuo*.

The properties and numerous industrial applications of the acid and its salts are described with reference to the literature, including the detailed table of Chamberlain and co-workers for alginic acid and its various Ca, Al, Cr. and Be salts.

Some account is also given of the so-called dead algae of which there are large deposits along the Spanish coasts. These, too, have long been used as a source of fertiliser, both in the north and on the eastern coast. In Galacia it is said that some 100,000 tons are collected annually for the purpose. This presumably refers to wet weight. Near Denia, on the east coast, are very considerable banks, more than 100 metres long and two metres or more thick.

COMBUSTION OF COLLOIDAL POWDERS

(*Continued from page 346*)

the gas pressure, but not on temperature.

This may be simply explained by realising that the gas, owing to continuous emission, does not actually contact the powder. For example, a powder emitting gas at 2500°C. and burning under constant pressure of 1000 kg./cm.^{2}, would not show change in the rate of combustion if the hot gases were replaced by an inert gas, such as nitrogen, at ordinary temperature but under the same constant pressure.

Briefly, the method of test used and already described (*loc. cit.* 476) was as follows: A cylindrical sample (strand) of powder was placed vertically in a large steel container filled with nitrogen under pressure, provided with a mirror sufficiently robust to withstand pressures up to 50 kg./cm.^{2}. The top part of the powder strand was fired by a wire electrically heated. The combustion zone was displaced from above downwards, and propagation was observed in the mirror, the time of traverse being noted for distances of 5 cm.

Pressures were 10-20 and 50 kg. Velocity with the latter pressure agreed well with that deduced from firings under 2000 kg./cm.^{2}, using the formula: $V = a + bP$. With a pressure of 10 kg., the observed velocity was definitely less than that calculated, but analysis revealed the presence of a substantial amount of NO in the gases. Visual observation also showed that luminosity in the combustion zone was much greater with 50 kg. pressure than with 10 kg.

The author finally describes and discusses the use of his method in the U.S.A., *e.g.*, by B. L. Crawford and co-workers (*Analyt. Chem.*, 1947, *19*, 630-633). Quoting their results, he says it is of interest to compare their velocities with those calculated from the explosion temperature using the formula already given by Muraour: $\text{Log } V = 1.37 + 0.27 \dfrac{T}{1000}$, under a constant pressure of 1000 kg., giving a speed of 273 mm./sec. or 136.5 mm. for one face. In the French experiments, the value of a is between 8 and 11 mm./sec. Applying these values, the same result was obtained for pressures of 1000 kg./cm.^{2}.

SYNTHETIC TANNING MATERIALS

Their Use in Light and Heavy Leather Manufacture

From A CORRESPONDENT

SHORTAGE of domestic tanning materials and the increasing cost of imported natural tannins from the Argentine and Uruguay, South Africa, Turkey, Borneo and India, have forced manufacturers to give increasing attention to the claims of synthetic tanning agents derived from indigenous raw materials. The so-called "syntans" or salts of condensation products, such as naphthalene or phenol formaldehyde, are widely employed as partial tanning ingredients, mordants or bleaches.

The use of these materials has increased, and in addition many newcomers continue to find application in both light and heavy leather tanning. Prominent among the more recent synthetic tanning agents are the melamine formaldehyde resins, which make possible the production of perfectly white leathers that are white all the way through and will not darken with age or exposure to sunlight.

Melamine tannage combines the best features of chrome and vegetable tanning and produces leathers that are highly resistant to heat and oxidation, while possessing improved fullness, texture and wearing qualities. In addition, melamine soluble resins may be used in combination with natural tannins or chrome tannage to impart increased fullness and abrasion resistance and to improve the colour.

Glyoxal

Dialdehyde-resin tannages are new developments derived largely from the research work by A. H. Winheim and E. E. Doherty after the war. These synthetic tannages are based on a new concept which involves the formation of a "reactive leather" which is subsequently chemically bound to resin formers. Many bi-functional compounds have been employed as initial tanning agents, but the principal development work has been done with glyoxal, the most satisfactory pre-tanning occurring in the *p*H range of 6.5 to 7.0.

The second step in the new process involves the introduction of monomers and prepolymers, followed by slow, controlled polymerisation. Ureas, thioureas, phenols and resorcinols have all been tried out quite successfully in conjunction with aldehydes. Blocking agents, or modifiers such as the primary, alkylated amines and certain sulphonyl chlorides, sulphonamides, and quinolinates, are all capable of modifying or altering the properties of the tanned leather.

Advantages claimed for dialdehyde-resin leathers can be summarised as follows:—(1) Improved resistance to repeated wetting and drying and therefore greater suitability for use in the shoe industry for both upper work and soles. (2) Improved resistance to perspiration, which qualifies the leather for high grade gloving and clothing. (3) Improved resistance to mild alkalis, and the ability to withstand repeated wetting and drying without deterioration means that dialdehyde-resin leathers compete in some measure with chamois leather.

Bulk Applications

The development of the dialdehyde-resin tannage from the advanced laboratory stage to large-scale factory practice depends largely on the availability of dialdehydes at economic prices. Glyoxal, the simplest of them, is not a cheap chemical and so far has not found what might be termed bulk applications in industry.

In mineral tanning, a good deal of attention has been given to the investigation of alternative tannages to chrome. Iron tanning has, of course, been studied for many years without any outstanding success. From recent research work carried out by T. C. Thorstensen and Ewin R. Theis, of the Lehigh University institute of research, it appears that basic ferric sulphate is superior to other ferric salts, and that sodium glycolate acts in such a way as to give a comparatively stable iron complex resulting in a real iron tannage.

This overcomes the difficulty which has always faced other workers in this field, namely, the apparent impossibility of preventing progressive oxidation of the leather, which is accompanied by a general weakening of the fibres, cracking of the grain and severe discoloration. Ferric sulphate is cheap and very plentiful, and sodium glycolate is in fair supply and reasonably economical to use in the quantities specified.

(continued at foot of next page)

Vegetable Oil Technology

Specialised Institute Established in S. India

THE technical backwardness in the Indian vegetable oil industry and the prospect of surpluses of edible oils if more advanced methods and plant were employed were referred to by Mr. Sitarama Reddi, Minister for Land Revenue, laying the foundation stone recently of the Oil Technology Institute at Anantapur in Madras Province. He indicated that in Madras Province 4 million acres are under groundnut cultivation.

Other important oil resources were copra, cotton seed and castor. It was necessary that there should be an institution which would help to study the various problems relating to the production and processing of oil.

Although at the moment edible oils were mainly retained for food purposes, there was now a good prospect of producing a surplus after meeting the food requirements of India. It would, therefore, be necessary to study in advance the future possibilities of the economic utilisation of these oils in other fields.

It was estimated that Madras Province produces in normal crop years about 250,000 tons of cotton seed annually. If three-quarters of this was crushed efficiently, it was estimated that about 28,000 tons of oil could be produced annually, in addition to valuable by-products.

The present condition of oil seed milling in Madras was far from efficient. By the introduction of modern methods of oil milling, both the yield and quality of oils from oilseeds would be considerably improved. Taking the examples of groundnut, copra and castor seed milling, if the present quantities of these three oilseeds were crushed by efficient methods, a total quantity of about 52,000 tons more of the oils could be produced. By using solvent extraction methods, a total quantity of about 66,000 tons of these oils, valued at about R. 10 crores, could be produced.

Continuous centrifugal refining resulting in the saving of 15 to 40 per cent of the refining losses involved in the conventional kettle method had materially improved the economics of the refining process. Not a single plant in India was known yet to have adopted this continuous process, which had been in use for nearly 15 years in the U.S.A. The institute is the first of its kind in India.

SYNTHETIC TANNING MATERIALS

(*continued from previous page*)

Zirconium salts have been used in tanning for several years now, most attention being devoted to zirconium sulphates ranging from acid salts through normal salts to highly basic salts. Tanning with zirconium salts gives a pure white, full leather of considerable toughness, which is held in great esteem for sportswear and bag work.

The technique of tanning with these compounds is simple and the salts reasonably economical in use; moreover, zirconium tanning is becoming increasingly popular. In order to increase the range of salts possessing tanning properties, some of the more complex sulphates which are known to exist in solution are being investigated.

Sodium phosphate and other phosphates are being used as pre-tanning agents, probably the most important being the glassy molecularly dehydrated sodium phosphate known as "Calgon." This possesses the property of combining with hide protein in acid solution, the pretannage being particularly useful when stock is to be completely tanned with vegetable tannins.

Phosphate tannage is essentially a combination between collagen and an acid, and, although phosphate leather is not a commercial product, there is no doubt that phosphates achieve a most useful purpose as pre-tanning agents. They reduce the astringent effect of strong tannin liquors on the grain of the leather, speed up the tanning process, and help to produce a lighter and more even colour.

The shortage of natural tannins has encouraged manufacturers of synthetic tanning agents to make greater use of sulphite cellulose liquor from paper works. This by-product is sometimes added to syntans, in such forms as sulphonated derivatives of phenol or naphthalene formaldehyde condensates. During the war years, the I.G. Farbenindustrie replaced 50 per cent of the total vegetable tanning materials with syntans of the Tanigan series, some of which contained appreciable quantities of sulphited cellulose liquor.

PROGRESS IN POLAROGRAPHY

Increasing Uses in Modern Chemistry

THE polarograph has many and diverse uses and is fast becoming an indispensable instrument in modern chemistry. It would be difficult to list the many applications of the polarographic method since they are continually being extended by the ingenuity of users.

It has, however, already established for itself a unique reputation for rapid and accurate analysis in such varied fields as metallurgy, pharmacology, plastics and medicine.

In view of the increasing attention being paid to this subject the following abstracts from "Polarography," a booklet just issued by Tinsley (Industrial Instruments), Ltd., London, are of considerable interest.

Polarography is an instrumental technique for rapid and accurate analysis, developed by Prof. Heyrovsky, of Charles University, Prague.

It is based on the interpretation of current voltage curves obtained by electrolysis of any solution containing electroreducible or electro-oxidisable substances. The curves are called polarograms, and both the concentration and species of the substance in solution can be directly determined from the characteristics of these curves.

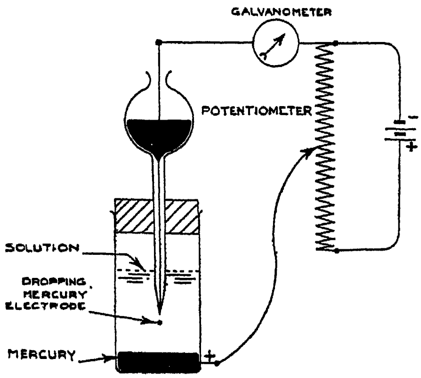
Mercury Cathode and Anode

To obtain a polarogram, the test solution is electrolysed in a particular type of cell known as a "polarographic cell." The cathode of this cell is mercury falling dropwise from a fine bore capillary dipping into the test solution; the anode is a pool of mercury at the bottom of the cell.

A steadily increasing negative voltage is applied to the cathode while the anode remains at constant potential. The current change with increase of voltage does not follow Ohm's Law but rises in a series of steps depending upon the substances present in the test solution.

The current is measured during the electrolysis and is usually recorded, the voltage at which any particular step occurs being clearly indicated on the record.

For the research worker, polarography has added yet another technique in the investigation of fundamental processes. New knowledge has been gained concerning the mechanism of electro-oxidisation and reduction and galvanic corrosion.



Courtesy of Tinsley (Industrial Instruments), Ltd.

The sequence of the reactions in organic synthesis can also be shown using the polarograph as an indicator.

The first polarographs were hand operated, the galvanometer current and the potentiometer voltages being plotted manually on graph paper.

Photographic recording of the movement of the galvanometer was the next development. This had the advantage of giving an automatically recorded polarogram, but the high sensitivity required made it necessary to use a galvanometer with a long time constant and therefore heavy damping.

This caused distorted wave forms in many instances and introduced errors which could not easily be detected.

The latest development in recording polarographs has been the application of d.c. amplification to the current passing through the solution in the polarographic cell.

By this means it is possible to use a pen recorder which gives a direct and instantaneous record of the change in current during analysis.

The excursions of the recorder pen are completely undamped, and the exact value of the maximum current at the instant of fall of the mercury drop is shown.

BUDGETARY AND STATISTICAL CONTROL

Factors in Internal Planning in Chemical Plants

by S. HOWARD WITHEY, F.Comm.A.

IN prevalent conditions in chemical industries, a heightened degree of organisation and scientific management in all sections and departments has become essential if the best results are to be obtained. This requires that the operations at each works shall be carefully planned and the most appropriate methods of accounting and costing maintained.

Costs Factor

The earnings reported by some chemical manufacturers during the 1948-49 financial period registered a very welcome recovery, but in some branches of the industry the costs factor tends to be unmanageable. A few companies are faced with financial difficulties, due either to the steep rise in replacement costs or to failure to institute wise directional policies and effective methods of internal check and control.

In the past, some managers and executives have been inclined to regard budgetary and statistical control in the same light as national or government control and as a needless interference which converts business into a kind of mechanical operation. Such viewpoints no longer receive serious support. Personal initiative is not necessarily stifled by the adoption of internal methods to aid departmental control or to indicate in good time the steps which should be taken to cope with new or impending developments.

It is possible to place too much emphasis on certain aspects of industrial planning, but the importance of control is likely to increase rather than diminish during the next few years and co-ordination of different departments in the fulfilment of predetermined plans is incapable of crippling individual performance.

In some instances the plan of operations will cover a definite period—a year or six months—and in addition to the fundamental requirements regarding such things as production, sales and finance, special consideration is given to the nature of the practical work to be undertaken by costing departments in the compilation and classification of labour costs, materials costs, etc., the allocation of operating and overhead expenses and in the treatment of other items which are capable of analysis.

Reports are often needed from departmental managers and shift foremen who have to carry out the firm's general policy, and many managers are now able to draw on facts that very materially facilitate the preparation of daily reports and reliable estimates which can be subdivided geographically or into time periods by reference to specific materials or products.

By planning the volume of production over a definite period and converting the figures into index numbers, some firms are better able to make allowance for all essential factors and to forecast a curve. In some offices budget operations start with a geographical classification of sales, a certain area—such as a county—being taken as the unit and its population and buying power ascertained in order to determine the quota of business it is expected to transact.

Expenditure can generally be classified under the general headings of labour, materials, fixed charges and overhead expenses, and in proportion to the turnover some of these expenses may remain fairly constant; others show very wide variations.

Foremen's Reports

In most instances, it will be convenient to initiate the system of statistical control with the compilation of essential data on the part of the plant foremen, embodying particulars relating to production, consumption of materials and plant performance during each shift. These reports preferably should be designed to enable the data to be recorded in terms with which the foremen are conversant, the quantities of acid used during the shift, for example, being shown in inches as measured from the tanks. All occurrences of which the oncoming foreman should be advised, including any breakdown, will be noted, and the reports should give accurate records of the number of employees at work, the number absent, and the number of units in proper working order.

When the products of one department are the raw materials of another, the transfer of materials within the factory will call for the greatest accuracy in the returns. The sheets relating to the production of mixed acid, for instance, should give the batch numbers, mixer numbers, the total quantity of each acid used and the total depth of the batch delivered to storage, as well as particulars of all acid transfers, including the time, storage tank numbers, and the dips as registered before and after the transfer from one named department to another.

Whether the product is to be sold or used in the production of other material, each process should be treated as self-contained, and if more than one stage is required for final production each stage should be regarded as a complete unit.

Each department will be under the control of a manager who will have foremen in charge of each shift and operation, and each shift foreman should be instructed to prepare a daily report. These reports should be collated by the manager at the end of the day and the particulars summarised and forwarded to the statistical office. A typical style of daily report sheet is indicated below:—

.... *Department*

Report......................hours ended ....

Consumed	Quantity	Produced	Quantity

Labour	......................Shift	....Shift	......................Shift
on			
off			

Transfers					
To ....Dept.					
To ... .Dept.					
To ....Dept.					
To . ...Dept.					

Signed..

In practice it is found that rises and falls in output in relation to labour costs can be displayed much more effectively by the use of graphs and line charts than by ordinary returns, and in some instances it is possible to estimate demand for specific products by ascertaining the percentage growth of past turnovers and by increasing the production figure by a similar percentage. This method is not very exact, however; conditions do not remain static and schemes are frequently subject to change which has the effect of altering the relationship between the quantities of acid and materials in process and the rate of production.

A typical plant is likely to consist of a series of storage tanks for the raw materials, a number of measuring tanks and mixers and the tanks of mixed acid for delivery to storage, and the report sheets should provide for the recording of the quantities used in making the various batches.

The statistical office will act as a clearing house for the works manager and should receive daily reports from the traffic department, giving particulars of all materials received and despatched and information from the laboratory based on the analyses of materials.

Mixed acid is usually prepared by running the correct quantity of each constituent into a measuring tank and then transferring to the mixer; accordingly the condition of each mixer at the end of each shift should be recorded by the foreman, and the causes of any breakdown noted. The number of men working and absent will be shown in the engineer's report, which will also indicate whether the progress of maintenance work is satisfactory. In regard to the larger repair jobs, it is advisable to arrange for approximate dates of completion to be given.

The main factors to be considered in the preparation of a production budget are the number of units required, the cost of materials to be used, the amount of direct labour, the indirect labour cost, works burden and overhead charges. These may be collated by means of a number of subsidiary budgets.

Direct Works Expenses

In some large works separate planning statements are prepared for determining the cost of repairs and maintenance, depreciation, power, heating, supervision, etc., and in research and general laboratory work the charge for salaries and wages is often debited to the production departments on a percentage basis, varying in ratio according to the number of hours spent by the officials in each department. Direct works expenses can usually be allocated by the engineers, the wages department and the general stores, while indirect expenses may be debited in the same proportions as the net amounts for a given period bear to the total.

Some firms engaged in the manufacture of several products receive certain materials in rough bulk lots and the material has to be loaded on barrows, wheeled to a hopper and broken into small particles in grinding machines before being mixed with other raw material or stored in bulk, and when large quantities of materials have to be purchased and unloaded in the open for transfer to storerooms located in the process building the material should be carefully weighed before being passed into process. It is a good plan to use bins of the same size to enable the quantities on hand to be readily determined at any time. That policy facilitates easy checking of foremen's daily reports.

The practical utility of budgeting and control by statistical means will depend largely on the methods employed for presenting the data. Experience has proved the advisability of summarising the information in a special book which has been designed to give the daily figures and weekly totals. Such a book should be provided with separate sections for each description of material or constituent, these sections being subdivided to show the weight used, in tons, and the yield, and columns should be ruled for information relating to labour, consumption of power and water, and the number of bags emptied and ready for disposal

Particulars connected with production, labour, and costs, etc., are frequently placed before works managers in the form of charts and this is, on the whole, a simple and a satisfactory method of presenting essential information. Each production chart can be divided into weeks and days to cover a full month's operations, and the systematic recording of each day's production will enable the works manager to see at a glance whether the different departments are contributing their proper quota towards the firm's programme. A good general pattern of production chart is reproduced on the facing page.

By preparing graphs for each final product the process efficiency of each stage can be ascertained and compared week by week. As a rule, a report is sent to the accounting department each month giving quantities of products manufactured and containing the following information as summarised from the daily records:—

Opening stocks
Adjustments (surplus or shortage)
Purchases
Production
Transfers from . . . . . .
Sales
Used
Transfers to . . . . . .
Closing stocks.

Although the audited accounts of many chemical manufacturing and allied companies show that during the past year production costs have been cut, there is little doubt that a wider application of such methods as the progressive assembling of plant and machines, more scientific purchasing of material, improved personnel management and the maintenance of effective systems of internal control would enable the selling prices of some chemical products to be lowered.

Estimating Selling Prices

The majority of producers realise the paramount importance of adopting suitable and uniform methods of ascertaining the cost of each process, operation and contract, and the advisability of compiling accurate statistics on which to base quotations. While the quality of British products is appreciated by overseas buyers, the general level of prices is still too high. Many manufacturers, moreover, are unable to produce in sufficient variety, owing to lack of suitable plant and equipment.

Maintenance and constructional engineers are constantly seeking ways of raising the process efficiency of plants, and profitable attention has lately been

PRODUCTION CHART

Day	Month	Date	.... Oxide		.... Acid		.. ..Liquor	
			Schedule Tons	Production Tons	Schedule Tons	Production Tons	Schedule Tons	Production Tons
1st Week								
			(2nd, 3rd and 4th week in same form)					
Month								

given to more economical distribution of power. Production executives have still not generally adopted a practice of estimating production in terms of plant-hour cost, and costing systems must take into account all expenditure on repairs and replacements calculated to prolong the service or useful life of individual units of profit-earning equipment, including the cost of up-to-date attachments and special devices.

Before any true profit can be realised a variety of charges and expenses have to be covered, and when working out the details of a system of control it is very necessary that full consideration should be given to the accounting principles. Jobs should be put in hand as soon as the customers' instructions have been confirmed and, as far as the workshops are concerned, the orders will resolve themselves into so much materials and constituents and so much time spent on processes, operating, grinding, etc.

The term "prime cost" usually signifies the cost of materials, labour, and such direct expenses as foremen's wages, the salaries paid to inspectors and superintendents, the rent of the factory and workshops, the cost of maintaining the plant and equipment to be employed over extended periods, depreciation in the value of wasting assets. But in order to arrive at the total cost of any job, operation or process, fixed charges of various kinds have usually to be added to the prime cost, including office expenses, selling expenses, travelling expenses, commissions paid to representatives and agents and the salaries paid to engineers, storekeepers, and booking clerks, as well as managers' and directors' remuneration and the cost of research and laboratory work.

Large items in the cost statistics will come under the headings of process labour, operating labour and grinding labour, and the method of organisation and control is facilitated by appropriate methods of recording the wages paid out.

Workers who are paid at a straight hourly rate are often provided with a card on which to enter details of the work performed on each day of the week, these cards being initialled by the foreman or charge hand, whose records are passed on daily to the office for comparison and for preparation of the wages sheets. Particulars shown on the wages sheets include the number and name of each worker; the number of hours worked each day; the total hours worked during the week; the rate of pay; gross wages; the various stoppages and deductions, and the net

Bench Fires in Chemical Laboratories

Report on Cambridge Investigation

DETAILED investigations into the type of fire most likely to be encountered in a chemical laboratory were recently carried out at Cambridge University.

The general incidence of such fires is fairly high, but in most cases they are dealt with by the chemist in charge, the public fire brigade only being called upon when they get out of hand.

Bench fires involving inflammable liquids and / or gases were found to be the most common type, and carbon tetrachloride the most efficient extinguishing medium. These are some of the conclusions published in the report by Chief Officer T. Knowles (Cambridgeshire Fire Brigade) and Mr. A. R. Gibson, M.A., superintendent of the university's chemical laboratories (*Fire Protection and Accident Prevention Review, 9*, 393, September 1949).

Gaseous fires are comparatively rare, but gaseous explosions are not, and these frequently lead to fires.

In dealing with the theory and practice of methods of extinction, the investigators discuss the merits of various media and describe some appliances used. It is pointed out that the Fire Officers' Committee has not approved the use of methyl bromide for general purposes, but there is no serious objection to its use in laboratories in conjunction with other types of extinguishers.

Fifteen practical experiments were carried out using the various extinguishing media, close attention being paid to the time required for complete extinction, and the conclusions reached are that:

Carbon dioxide, although a clean, efficient medium for fires contained in vessels into which the gas can be discharged, and by reason of its greater weight will remain, is not wholly effective for controlling fires involving spilt liquids burning on the surface of a bench.

Methyl bromide is expensive, has greater toxicity than carbon tetrachloride and has the great disadvantage of being a gas at normal temperature and pressure with the result that it behaves somewhat like carbon dioxide in that for surface fires it is difficult to blanket the fire completely. The extinguisher, too, has to be recharged at the factory.

Carbon Tetrachloride

Foam, either chemical or mechanical, although quite effective, causes much mess and is likely to disorganise work for some little time after. Foam could be regarded as supplementary to carbon tetrachloride in cases where the fire assumes large proportions but in these cases the fire brigade is likely to be in attendance.

As a result of the experiments Chief Officer Knowles and Mr. Gibson make the following recommendations.

For immediate first-aid use, the 1 quart size of carbon tetrachloride of the pressure-operated type appears to be the most effective weapon, and it is suggested that these should be provided one to each pair of benches in the large laboratories and one to each small research laboratory. To back up these small extinguishers, appliances of 2 gal. capacity should be allocated. These, it is suggested, should number about 25 per cent of the smaller type installed.

These 2-gal. appliances might well consist of the pressure-operated type with gas cartridge, but filled with carbon tetrachloride instead of water, as during the tests it was quite evident that manually-operated hand pumps were difficult to control, especially if handled by only one man. In this event care should be taken to see (1) that a nozzle giving a straight jet only is used and not a variable nozzle, and (2) that the directions printed on a transfer attached to the gas cartridge do not ultimately slide off after long immersion in the carbon tetrachloride with the possibility of clogging the discharge tube or nozzle.

BUDGETARY AND STATISTICAL CONTROL

(*continued from previous page*)

sum payable, and these particulars should correspond with the daily time sheets kept by the foreman, charge hand, or works clerk.

At the present time there are numerous schemes in operation to secure the cooperation of the workers and at the same time reduce costs of production. The percentage addition to wages should therefore bear some relation to increased process efficiency.

CHANGES IN GERMAN CHEMICAL POLICY

Reduced Demands Bring Intensive Competition

WEST German authorities are now preparing the ground for industrial programmes for the rest of this year and the early part of 1950.

While coal production is continuing to increase—the daily average in July was 1400 tons above the target of 335,000 tons—there has been rather less demand for coal from industries, including heavy chemicals producers who, according to the mid-year report of the Economic Department of the bizonal Executive Committee, may not draw their full quota. The supply position for iron and steel has so improved that control regulations are often ignored now without any detriment to essential consumers.

So equally has the output of primary aluminium, electrolytic copper and crude spelter increased during the first half of 1949 that consumers are moderating their applications for forward delivery. Marketing difficulties have resulted in a sharp contraction in the production of secondary aluminium alloys.

In chemical industry, the Economic Department reports, the production of calcium carbide has nearly been doubled since the beginning of the year and the manufacture of soap increased by two-thirds. The output of nitrogenous fertilisers and potash salts also increased, but production figures for sulphuric acid and coal-tar dyes were slightly reduced and those for plastics considerably down on the early months of 1949.

Planning Production

Chemical fertiliser prices for the agricultural year which began in July have been held at the 1948/49 levels, at a cost to the public authorities and the taxpayer for subsidies of Dm. 105 million (about £8 million). The production plan for 1949/50 covers all three zones of Western Germany, the French as well as the Anglo-U.S. zones, and provides for 400,000 tons of N, 260,000 tons of P_2O_5, 610,000 tons of K_2O and 1.5 million tons of lime. The figures can be related with sales in the Anglo-U.S. zones alone during 1948/49 of 310,000 tons of N, 356,000 tons of P_2O_5, 499,000 tons of K_2O and 1.2 million tons of lime.

Burbach Kaliwerke A.G., one of the three leading potash producers in Western Germany, reports that its production has risen from 44,500 tons of K_2O in 1946 to 90,000 tons annually and, when the Niedersachsen-Riedel group has been extended, will reach 120,000 tons. The project of resuming production in the Königshall-Hindenburg group has been advanced as far as possible, but financial difficulties have compelled the company to curtail its reconstruction.

Trade negotiations are in progress with a number of countries, including Switzerland, Austria, Holland, and Jugoslavia. These supplement the substantial new business arranged with Turkey and Eire. Before July 1950, Western Germany is to supply £57,500 of potash salts, £37,500 of dyestuffs, colours and paints, and £25,000 of industrial chemicals to Eire.

Influx of Refugees

Novel pharmaceuticals and plastics and the chemical utilisation of indigenous raw materials are mentioned as providing opportunities for new industries in Schleswig-Holsten, Germany's most northerly State, which has admitted a very large number of refugees from the East and is therefore in special need of developing fresh avenues of employment. Of 70 firms manufacturing chemicals in the area about one-quarter has been set up by refugees from the East. The four biggest undertakings are the fertiliser works at Rendsburg, the Kali-Chemie A.G. factory at Brunsbüttelkoog, the match factory at Lauenburg and the Nordmark pharmaceutical works at Uetersen.

Many of the firms set up since the war have found it impossible to cope with competitive conditions since the currency reform, and some have had to close down.

In the extreme South-West of Germany, in Baden, chemical manufacturers also report that sales are declining and competition is growing more severe; they complain that chemical manufacturers in the Anglo-U.S. zones are receiving more favourable treatment, as regards import permits and currency allocations.

Soap manufacturers complain that, by buying large quantities of raw materials at high prices and prohibiting further imports at the lower prices ruling now, JEIA has made it impossible for them to lower their prices. Present stocks of oleaginous raw materials are said to be sufficient for about twelve months.

German Appeal for Chemical Expansion

Some Industrialists' Views on Dismantling and Research

IN the first issue (No. 1, July 1949) of *Chemische Industrie*—revived after suspension lasting since 1945—the president of the Arbeitsgemeinschaft Chemische Industrie (W. A. Menne) discusses some of the difficulties of German production, including particularly those arising from dismantling and prohibitions imposed in respect to the Fischer-Tropsch processes.

He argues that there are numerous problems which, according to whether they are well or ill handled, will promote or hinder the smooth co-operative working of such a highly diversified group as the chemical industry—and may even entirely disrupt it. The difficulties, he says, will persist so long as the present deplorable division into east and west zones remains, coupled with an inflexible dismantling policy and drastic restraint in certain directions.

Plants and Processes

Claimed to be needed are more precise definition of what is implied in the Fischer-Tropsch plants and processes, and the liberation of those parts which do not essentially belong. According to the German view, it is contrary to economic reasoning to include in these restraints the production of primary products, *i.e.*, synthesis gases, and plant for working up primary products, such as distillation, cracking, and refining plant, states the article in *Chemische Industrie*. There is, moreover, a series of related and auxiliary plants and processes that could be linked up with them.

Because dismantling proposals cover far too comprehensive a field of chemical activity, German industry, says W. A. Menne, is excluded from the entire scope of catalysis with its manifold possibilities, some yet scarcely fully appreciated. It is precisely in this field that German chemists claim to have been among the leading pioneers, and the F.T. process is being adapted in many parts of the world, notably in Allied countries; also a Buna plant is being erected in India.

The terms of the Washington agreement in this respect are, therefore, the more onerous to Germany, and much is made of the fact that other countries, including Japan, are given free access and even encouragement. These restrictions, writes W. A. Menne, may indeed upset the whole balance and structure of German economic life, including the growth of export trade, which is among the first essentials of sound recovery.

While Germany has to recover as much of her export trade as possible, the required increase in the chemical section in 1952-3 to twice or three times that of the estimated total for 1949 does not represent a realistic view of the position. The writer proceeds to discuss in some detail the possibilities, and also potential disappointments, of ERP policy as it affects Germany. He concludes with a warning against unwarranted optimism about recovery, and reaffirms his faith in German capability to overcome present difficulties and recover her accustomed place in the economic community.

Prof. Dr. Otto Bayer, of Leverkusen, writes on the fostering of research as the life blood of chemical industry. Conditions in Germany, however, are at present abnormal, and research has to be viewed also from an unusual point of view, says Prof. Bayer, who surveys the present position of university students in comparison with that of other countries. The number of students per 10,000 population in Germany in 1925 was 15, and in 1948, 16.

In the U.S.A. it increased from 45 in 1930 to 179 in 1945; and in Russia from 15 in 1922 to 48 in 1947. In England it was 17 in 1945, the lowest of any except Germany in recent years. It seems, however, that an accurate definition of what comprises a student is necessary before these figures could be taken as a fair comparison.

Future Outlook

Many other difficulties are noted, and Prof. Bayer takes a pessimistic view of the prospects. He dwells at some length on the very different picture presented by the U.S.A., and recalls that most of the really fundamental creative ideas have come from Europe, especially Germany. Europe, including Germany, must not therefore be allowed to sink.

The writers present, from their point of view, a powerful case, and it is difficult to avoid a certain amount of sympathy. Yet it seems necessary to recall occasionally, without being ungenerous, the fact that Germany lost the war, and to ask whether we should have been better treated had the position been reversed.

FIRE PREVENTION

Some Original Work by DSIR

AN account of the year's progress by the Joint Fire Research Organisation is given in "Fire Research 1948" published this week for the Department of Scientific and Industrial Research by HMSO (post paid 1s. 2d.).

It contains the report of the Fire Research Board and the report of the Director of Fire Research for the year.

Among the original matters raised is an investigation of the possibility of rendering some highly inflammable liquids safe by the use of suitable additives.

It is recalled that the suggestion has been made from time to time that certain chemical fire extinguishing agents of the methyl bromide type could be dissolved in combustible liquids so as to remove completely the fire hazard of stored liquid. It has even been suggested that by choosing an agent of appropriate volatility, the liquids might still be usable in internal combustion engines, though incombustible while in bulk.

Aviation spirit and aviation kerosene were chosen for experiment as likely to present the greatest practical difficulties. The results showed the method is not practicable with spirit, using the inhibitors at present available. With kerosene its practicability is doubtful.

Considerable interest has been shown in the use of wetting agents for fire fighting. Preliminary experiments have indicated the range of special applications in which they are worth considering; they do not appear to offer any spectacular advantage in general fire fighting.

An interesting conclusion from the examination of a sample of a pre-war foam compound, intended for suppressing oil fires, which had been stored in a hot climate (Singapore) was that there had been no appreciable deterioration of either foam production or heat resistance.

Building Research in Scotland

The Building Research Station's Scottish laboratory at Thorntonhall, near Glasgow, is now partly completed and a nucleus of staff has begun work there. To introduce the new laboratory a one-day conference is to be held in the Rankine Hall, Glasgow, on Thursday, October 6. Lord Morrison, Parliamentary Secretary, Ministry of Works, will preside, and at the afternoon session the chair will be taken by Mr. W. K. Wallace, chairman of the Building Research Board, DSIR.

TAR SURFACINGS

Technical Study of Oxidation Effects

RESEARCH with the object of improving the durability of tar surfacings is being carried out at the Road Research Laboratory, DSIR, and the first stage of the work is described in "Road Research Technical Paper No. 16—The Reaction of Oxygen with Tar Oils," now published by HMSO (post paid 11d.).

Prolonged exposure to weather affects the properties of all bituminous roadmaking materials, until eventually the tar becomes brittle at low atmospheric temperatures. In that condition the tar bond is broken by the action of traffic, stones break away from the surface and disintegration begins. The effects are more pronounced in those types of road material in which a relatively thin film of binder on the surface of each stone is exposed directly to the atmosphere. This applies particularly to medium and open-textured carpets.

The Road Research Laboratory has been studying the causes of weathering in tar and has established that the most important agent is the oxygen in the atmosphere acting chemically upon the constituents of the tar. This has led to a detailed examination of the reaction of oxygen with the tar and the results of the first stage of the work, the oxidation of the oily constituents of the material, are described in Paper No. 16. Results from this investigation are being applied to a study of the whole tar.

This first report is necessarily inconclusive and is concerned very largely with methods of test and general procedure.

The immediate objectives of the work are to develop laboratory tests for assessing the susceptibilities of road tars to oxidation and to evolve methods of improving tars of low durability. The work is part of a programme of research undertaken in co-operation with the British Road Tar Association on the advice of the joint Tar Research Committee.

More Coal Raised

Britain's total output of coal last week was 434,700 tons more than in the previous week, when labour troubles caused a lessening of production. Comparative figures are:— Last week: 4,201,300 tons (deep-mined 3,932,700 tons, opencast 268,600 tons). Previous week: 3,766,600 tons (deep-mined 3,504,900 tons, opencast 261,700 tons).

PACKAGING STANDARDS

BSI Code for Industry

THE Packaging Code (BS 1133), originally prepared in 1943 by the British Standards Institution to satisfy an urgent war-time need, has now been issued in a completely revised and extended form. The compilation was by a BSI committee representative of 24 trade and scientific bodies, a number of large trading concerns, and government departments.

Considerable structural and textual changes have been made to the code to suit present needs, particular emphasis having been given to the packaging of the products of industry for home and overseas distribution. The work has been deemed too large to issue, or even compile, as one complete entity. It is therefore being published as 17 sections.

The first three sections are grouped together as the "Introduction to Packaging," in which the principles governing design, construction, and materials are outlined. Five other sections are also available in completed or provisional form, viz: wooden containers; textile bags, sacks and wrappings; packaging felt; adhesive closing and sealing tapes; tensional steel strapping.

Four more sections are in an advanced state of preparation and are expected to be issued in the near future. These deal variously with mechanical handling of containers, corrosion, paper, and wicker and veneer containers. The few remaining sections will deal with such subjects as protection against pest and mycological attack, and metal containers.

The section of the code devoted to textile bags, sacks and wrappings, which is obtainable from the British Standards Institution, 24/28, Victoria Street, London, S.W.1, at 3s. net, postage paid, gives detailed information on the most suitable materials for the packaging of particular industrial products, also methods of closing the sacks and other containers. It contains a number of pictures illustrative of materials and methods of packaging, and lays down rules for the safe and convenient stacking and storing of packages of varying sizes and shapes.

New Address

The registered office and only address of Charles Midgley, Ltd., a subsidiary of Evans Medical Supplies, Ltd. (formerly of City Road, Manchester), is Speke, Liverpool 19; telephone Hunt's Cross 1881.

PRICE CHANGES

Zinc Prices Increased

THE price of good ordinary brand zinc was raised last Monday by £2 15s. per ton (delivered), from £63 10s. to £66 5s.

This was stated by the Ministry of Supply to be due to the rise in the price of zinc on the American market.

As a result, a corresponding advance is notified in the rates for zinc oxide—of £2 6s. 6d. per ton for lots of not less than two tons delivered buyers' premises. Red seal rises from £63 10s. to £65 16s. 6d., green seal from £65 to £67 6s. 6d., and white seal from £66 to £68 6s. 6d.

Vegetable Oils Cheaper

THE Ministry of Food announces that during the 4-week period ending October 1 the following reductions in the prices of unrefined oils will take effect:—

Linseed oil from £138 to £126 per ton naked ex works.

Linseed oil foots from £88 to £76 per ton naked ex works.

Castor oil first from £110 to £98 per ton naked ex works.

Castor oil seconds from £103 to £91 per ton naked ex works.

Rapeseed oil (Chinese) from £170 to £130 per ton naked ex works

Rapeseed oil (other) from £180 to £140 per ton naked ex works.

The prices of all other unrefined oils and fats, and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

German Plant Available

THE United Kingdom is bidding for some of the plant about to be allocated between the member nations of the Inter Allied Reparations Agency.

Included in the list of equipment available is plant from the I.G. Farben Leverkusen (serial B/S/133). For the section for the production of polyamides and miscellaneous resins, application should be made to the Board of Trade, RMD, RM5A, I.C. House, Millbank, S.W.1. Another section for the production of hydrazine hydrate is the concern of the Ministry of Supply (G.5e), Shell Mex House, Strand, W.C.2

This is the final invitation for applications, which should be made by September 15.

The Chemist's Bookshelf

A New Dictionary of Chemistry—(2nd Edition). Edited by Stephen Miall and L. Mackenzie Miall. 1949. London: Longmans, Green & Co. Pp. 589. 60s. net.

The first edition of this dictionary was published in 1940, but unfortunately all the existing stocks were destroyed in the raid on the City of London in December of that year when Paternoster Row was burnt down. War difficulties and other problems have prevented a new edition appearing until now. The dictionary remains the same in its general character and design, and supplies the need of a compact work of reference not only for chemists, but others who need accurate information on chemical matters. The work is in fact a miniature encyclopædia containing not only explanations of terms used in chemistry and chemical engineering, accounts of chemical substances and chemical operations, drugs, vitamins and biochemical subjects but also biographical notes about individuals of historical importance. Included are new articles on atomic energy and the sulphonamide group of drugs. A number of new biographies has also been added. There is a valuable table of physical constants of some 1800 organic compounds prepared by Mr. F. G. Crosse.

It is noted with regret that Mr. Stephen Miall died before the completion of the work, but the final revision of proofs, etc., was carried on by his son, Mr. L. Mackenzie Miall.

Condensed Review of Pharmacy (6th edition). George W. Fiero, Phar.D., Ph.D. 1949. New York and London: John Wiley & Sons, Inc., and Chapman & Hall, Ltd. Pp. 121. 18s. net.

A complete condensed compendium of the drugs, chemicals and preparations of the United States Pharmacopœia (13th revision) and of the National Formulary (8th edition) is supplied in this book. The work, which has been entirely re-written to conform with the English titles used in the USP and NF is divided into five parts: Practical pharmacy; galenical pharmacy; *materia medica;* toxicology and elementary chemistry. Organic and inorganic chemicals are listed separately, also the common names of official drugs, and there is a comprehensive index.

The Soils of Palestine. A. Reifenberg. Revised second edition. London: Thomas Murby & Co. Pp. 174. Plates 18. 16s. net.

The investigation of the properties of the soils of Palestine is a task of primary importance, and the problem of restoring the ancient fertility is one that must be of considerable concern to the Israeli government. The author, who worked on soil problems for 13 years at the Hebrew University, Jerusalem, produced a general survey in 1937, of studies in soil formation and land utilisation in the Mediterranean. In the present revised second edition, translated by C. L. Whittles (soil chemist, West of Scotland Agricultural College), progress in exploration of Palestinian soils in the last ten years is recorded, and a short survey on the Jordan Valley Authority is included. New chapters have been added dealing with soil erosion and the effects of saline irrigation water. A bibliography is given at the end of each chapter, also a number of useful tables and diagrams, a subject and author index, and 18 well-chosen plates.

" BUBBLE flotation " is generally agreed to have been discovered by Alcide Froment in 1903. Since then science has learned much about bulk and selective flotation, aspects of which—modern theories and applications—are illustrated with pictures and descriptions of its own flotation and grinding plant in Bulletin No. F.10, B.29 " Denver Sub-A Flotation," now available from the Denver Equipment Co., Denver, Colorado, and London. This refers also to the laboratory service which is available both for batch and continuous pilot plant tests.

THE 1950 issue of the Scottish Wholesale Druggists' Association catalogue is now being prepared and will be published in December.

CHEMICAL EDUCATION

Autumn Programme in London

A WIDE range of subjects for day and evening classes, part or full time courses, is contained in the prospectus of the Sir John Cass Technical Institute for the 1949-50 session, the first term of which begins on September 26.

The institute is recognised by the University of London for the award of internal degrees in science and metallurgy, and is one of the few centres of higher education in the City of London.

Courses of lectures and practical work in organic and analytical chemistry include: microchemistry; spectroscopy; organic chemistry for post-graduate students; statistical methods in scientific and industrial research; recent advances in colloid chemistry; chemical plant and processes; German for chemistry students; and petroleum technology.

Varied Studies

Among the lectures to be given during the session are the following:—

"Statistical Methods in Scientific and Industrial Research," by D. R. Read; 24 lectures on Monday evenings at 6.45 p.m., during the first and second terms. First series: Mathematical Statistics, beginning September 26; second series: Design of Experiments, beginning Monday, January 9 1950.

"Recent Developments in the Chemistry of Antibiotics," by F. A. Robinson. Course of eight lectures on Friday evenings, at 6.30 p.m., commencing October 7.

"Microchemical Analysis," by David W. Wilson and F. Holmes. Ten lecture-demonstrations on Thursday evenings at 6 p.m., starting January 9 1950.

"Patents and Industrial Design Protection," by Eric Walker. Series of eight lectures on Thursday evenings at 6 p.m., beginning January 26 1950.

Australian Scientific Conference

Tribute to the work of Australian scientists in solving urgent problems associated with agriculture and industry was paid by Prof. T. Wallace, director of Long Ashton Agricultural Research Station, Bristol University, and Dr. James Stewart, of Moredun Institute, Edinburgh, at the conclusion of the British Commonwealth Scientific Conference in Adelaide last week. Further meetings will he held in Canberra to collate results and make recommendations.

NEXT WEEK'S EVENTS

SUNDAY, SEPTEMER 11

International Fair

Prague: Daily (until September 18).

International Autumn Fair

Vienna: Daily (until September 18).

MONDAY, SEPTEMBER 12

International Fair

Bolzano, Italy: Daily (until September 27).

TUESDAY, SEPTEMBER 13

British Pharmaceutical Conference

Blackpool: 86th meeting (until Friday, September 16). Some 22 papers will be read and discussed during the science sessions.

Incorporated Plant Engineers

Manchester: (East Lancashire Branch) Engineers' Club, Albert Square, 7.15 p.m. "Automatic Boiler Control," by a technical representative of Ronald Trist & Co., Ltd.

Dundee: Mathers Hotel, 7.30 p.m. Talk by members.

WEDNESDAY, SEPTEMBER 14

Institute of Petroleum and Institution of Fire Engineers

London: 26 Portland Place, W.1, 5.30 p.m. J. H. Burgoyne, L. L. Katan, and J. F. Richardson: "Application of Air Foam to Oils Burning in Bulk," and "Uses of Solid Carbon Dioxide to Extinguish Burning Liquids"; E. Thornton: "Some Practical Aspects of the Application of Foam to Large Oil Tanks."

THURSDAY, SEPTEMBER 15

Incorporated Plant Engineers

Liverpool: (Liverpool and North Wales Branch), Radiant House, Bold Street, 7.30 p.m. J. P. Harris: "Use of Steam for the Preserving Industry."

FRIDAY, SEPTEMBER 16-17

Society of Leather Trades' Chemists

Leeds: University, 9.30-12.15 p.m. Reading of papers by P. Danby; R. G. Mitton, and C. C. Posnett. 2 p.m. Paper by J. A. Lovern. 3.15 p.m. Business meeting. 7 p.m. dinner at the refectory: guest of honour, W. R. Atkin. September 17: Papers by W. Siddall and W. M. Ames.

International Autumn Fair

Budapest: Daily (until October 2).

"Open Door" Meetings

In response to repeated requests, the American Association of Consulting and Chemical Engineers, Inc., has decided to adopt a new policy of admitting to its meetings industrialists who are not members of the association.

◆ HOME ◆

Glass Containers Freed

The Board of Trade has made an Order—The Control of Containers and Packaging Order (No. 6) 1949—removing restrictions on the sizes of glass bottles which may be used for packaging of goods for the home market. The order comes into effect on September 12.

Fire at Ciba Laboratories

The works fire brigade at Ciba Laboratories, Ltd., Horsham, recently re-organised, was to be the subject of an experimental "alarm" when a real outbreak intervened. Fire broke out in one of the departments on August 30 and the works brigade dealt with it within a few minutes and had quelled it by the time the Horsham Fire Brigade arrived. Damage was negligible.

Progress at Grangemouth

The I.C.I., Ltd., chemical development at Grangemouth, was considered by the Dean of Guild Court there last week and approval was given to plans for a further extension, costing £370,000, representing the third stage of the £1 million scheme for the factory. Approval was also given to a scheme by Scottish Oils, Ltd., for the housing of workmen in a special camp during the work on the oil refinery development in the area.

Demonstration of New Rum Still

A new continuous rum still was recently demonstrated by the A.P.V. Co., Ltd., at its Point Pleasant Works, to a party of visitors from the Jamaican industry. The main technical features of the still, which has been manufactured for export to British Guiana, include: use of the APV-West high efficiency plate design for the rectifying column, easily cleaned plate used in the analysing column, and the APV paraflow heat exchanger.

Mechanical Seals

Flexibox, Ltd., associate of the M.O.R. Group, announces that its specialised range of mechanical seals for oil refinery and chemical process pumps has been chosen to equip the large petroleum-chemicals plant of Petrochemicals, Ltd. More than 100 Flexibox mechanical seals are used throughout the plant, mainly in centrifugal pumps dealing with naphtha, aromatised product, isopropanol, propylene, acetone and ammonia and in the isopropane agitators.

Chemical Works Visits

Recent visitors to the establishments of Evans Medical Supplies, Ltd., Speke, Liverpool 19, have included parties from the Sheffield branch of the Pharmaceutical Society, the Bolton Pharmaceutical Association, the University Settlement in Liverpool, students from the Liverpool School of Pharmacy, and student nurses from local hospitals.

N. American Exports and Imports

United Kingdom exports to the U.S.A. in July amounted to £3,815,000, 15 per cent more than the average for the second quarter of the year. Re-exports to the U.S.A. were £246,000. Imports from the U.S.A. were £20,534,000. U.K. exports to Canada, £6,686,000, were slightly above the second quarter level. Imports from Canada were £22,365,000.

Microchemists' Meeting

The Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists is holding a conference in Nottingham on Sepetmber 22. A special luncheon to members of the committee and microchemists attending the conference is being given on Friday, September 23 at the Black Boy Hotel, by L. Oertling, Ltd., manufacturers of microchemical balances.

Slackening of Scottish Paper Trade

Papermaking concerns in Scotland are experiencing difficulties largely due to a decline in home and overseas demand associated with the high price levels dictated by Government buying policy. Several plants have closed down, latest being that of Annandale & Son, Ltd., of Polton. Inveresk Mill, Musselburgh, is working on short time and West of Scotland mills are also known to be finding difficulty in supporting full output.

Chemical Precipitation

The Glasgow Highways Committee is to be asked to effect improvement in sewage disposal treatment in the city by chemical precipitation methods, to collaborate with other areas interested to improve the standard of cleanliness in the Clyde Valley area, and to modernise methods of treatment and layout at various sewage plants. It is considered likely that this will be followed by heightened demand by local authorities for a very much higher standard of recovery from industrial effluents.

THE WEIZMANN INSTITUTE

Scientists to See Progress in Israel

SCIENTISTS and scholars from Britain, America, France, India, Russia and a score of other countries have been invited to Israel for the opening on November 2 1949, of the new Weizmann Institute of Science at Rehovot. The massive building was planned as a birthday gift for Dr. Weizmann on his 75th birthday in 1944. Now, as President of Israel, he will be the guest of honour at the celebrations which will coincide with his 75th anniversay.

The new institute includes branches for isotope research, polymer research, biophysics, applied mathematics and optics, and has cost over £1 million. At the same time the foundation stone will be laid for a new institute of experimental biology and a £4 million endowment fund campaign will be launched to finance present research plans and other schemes.

Science and Industry

Mr. Meyer W. Weisgal, chairman of the institute executive council, described the new building as part of the scientific organisation directly related to the general development of Israel, to the exploration of its natural potential and the qualities of its resources, to the determination of soil processes, of chemical deposits and water content, and to the betterment and broadening of its industrial processes.

The institute, in conjunction with the Palestine Research Association at Harvard University, had for some time been experimenting with processes for de-salting water in the vast Negev desert. They had reached a point where it was possible to supply water fairly economically but not yet for irrigation.

PERSONAL

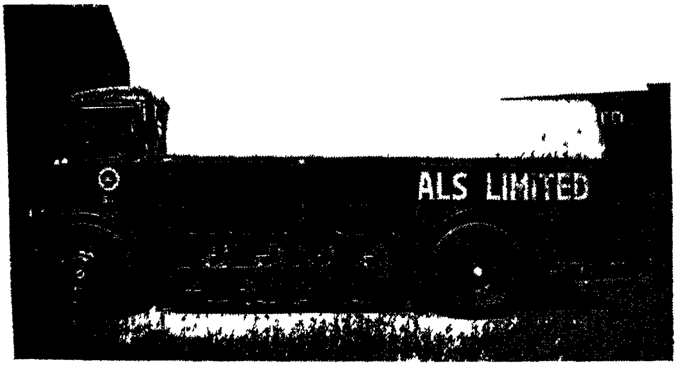
Italian Award to British Scientist

THE "Premio Europeo Cortina" prize of 1 million lira (£500), offered by the city of Cortina d'Ampezzo in conjunction with the Italian review, *Ulisse*, has been awarded to **Prof. John Read**, professor of chemistry and director of the chemistry research laboratory at the University of St. Andrews. The award is an appreciation of Prof. Read's book, "An Entry to Organic Chemistry," which was judged to be the best popular scientific work published in the last four years. Of the 35 entries, candidates for the Italian award, 11 were British, 15 Italian, five French, two Portuguese, one Dutch, and one Spanish. The British entries were considered outstanding, and the final choice lay between Prof. Read and **Prof. O. R. Frisch**, of Trinity College, Cambridge, whose book, "Meet the Atoms," was highly commended.

Mr. C. S. Terry, of the School of Pharmacy at the Royal Technical College, Glasgow, has been awarded the Wellcome Pharmaceutical Research Fellowship by the adjudicating committee. The Fellowship, valued £350, is renewable and Mr. Terry will undertake research on bacteriophages of *Pseudomonas Aeruginosa.*

Ostelin Silver Jubilee

Glaxo Laboratories, Ltd., recently celebrated the silver jubilee of Ostelin, the first concentrate of vitamin D preparation to be made available to the medical profession. It was first made in 1924 by Mr. G. P. Dodds, who is still with the Glaxo company.



The latest refinements in chemical distribution equipment are used in the new A.E.C. bulk delivery tankers built for Shell Chemicals, Ltd. That shown here has its panelling raised to reveal the delivery pipelines, each with Brodie-Kent meter, for separate deliveries from the two 500-gal. and two 400-gal. compartments

◆ OVERSEAS ◆

More Isobutyl Alcohol

Celanese Corporation of America has announced that volume production of isobutyl alcohol has begun at the Bishop, Texas, chemical plant. This versatile solvent and intermediate has been somewhat scarce for some time, and it is expected that the additional production will open up new methods of use.

Deep Drilling for Sind Oil

The Burmah Oil Company's test petroleum well at Lakhra in Sind is now 10,000 feet down, but no oil has yet been found. The well will be drilled as deep as possible, possibly to a maximum of 15,000 ft. Production at the BOC well at Chakwal, West Punjab, averaged 370 barrels a day during the week ending August 20.

World Tin Output

World production of tin in concentrates in June rose to 15,600 long tons, an increase of 2800 tons above the total for the previous month, according to advance statistics of the International Tin Study Group. Tin metal production for June was 14,000, a decrease of 700 tons on the May figures. The belief gained ground last week that the control of tin consumption was likely to be dispensed with in the U.S.A.

New Australian Tinplate Mill

A new tinplate mill under erection at Port Kembla, Australia, is expected to compare favourably with any similar plant in the U.S.A. It will have 29½ acres under one roof. The controlling company, Australian Iron and Steel, Ltd., which has ordered the necessary equipment, will use both electrolytic and hot dipping methods of plating, and expects to turn out 120,000 tons of tinplate a year, mainly for Australian consumption.

Dismantling Ruhr Chemie

Violent demonstrations and all the signs of determined resistance, which accompanied the first steps to dismantle the prohibited sections of the Ruhr Chemie works at Oberhausen in the Western zone of Germany, ceased when detachments of the Manchester Regiment took post at the factory this week. The work is now going forward, requiring 90 engineers and others, whose number will need to be increased when dismantling of the principal installations begins.

Coal Saving Plan

To conserve high class metallurgical coal resources and permit the utilisation of high-ash low-grade coals, India's Council of Scientific and Industrial Research has proposed that coal in pulverised form should be used for firing stationary and locomotive boilers.

New South African Nickel Lode?

The nickel bearing ore deposits in the Insizwa Mountains in Pondoland, Eastern Cape Province, are to be exploited by a Johannesburg syndicate. Permission has been obtained from the Minister of Native Affairs to prospect the area, with authority to acquire a lease. Geologists report that the ore also contains platinum, gold, silver and copper.

India's Fertiliser Project

Progress is reported to have been made in the construction of India's long-planned fertiliser factory at Sindri. It is hoped that the pilot plant will begin operation in March 1950, and that full production will be attained before the end of the year. The factory is expected to produce as by-product about 900 tons of calcium carbonate daily which will be used for the manufacture of cement. Proposals are also being considered for the production of 10 tons of urea, eight tons of formaldehyde, and 200-250 tons of soda ash per day.

Isotopes and Ceramics

The first supply of radioactive isotopes for use in ceramic research was recently received at the U.S. Alfred University. The initial task to be undertaken will be that of study of diffusion between metal oxides and ceramic materials. The scheme will, however, be wide enough to allow for research in several other fields according to the *Ceramic Age* (*54*, 1), two laboratories having been equipped for investigations in biology, chemistry and physics.

$10 M. Sodium Plant

The National Distillers Chemical Corporation is constructing in Ashtabula, Ohio, a $10 million plant, with a rated capacity of 100,000 lb. of sodium a day, which will be in production by April 1950. Copies of the booklet are being sent on request by Department A of the Corporation, at 120 Broadway, New York 5, N.Y.

CEYLON'S ILMENITE SANDS

Practical Steps to Exploitation

CEYLON'S valuable mineral sands are to be exploited, and tenders will be sought from manufacturers abroad to start civil engineering operations at the site near Trincomalee, on the east coast of the island. The Government of Ceylon has secured the services of Mr. A. D. Hughes, well known in the ilmenite industry in Travancore, South India.

The rich concentrates of black sands with about 75 per cent ilmenite, 14 per cent rutile and 9 per cent zircon, are found 30 miles north of Trincomalee, over a stretch of five to six miles, extending beyond the low tide mark. This is the principal site, but deposits are also found in other parts.

These sands are said to represent some of the richest ilmenite deposits in any part of the world. In titanium dioxide content they come second only to those of Travancore, which have about 53 per cent, while the Ceylon sands have 50 per cent.

Certain foreign concerns are stated to have offered to exploit Ceylon's mineral sands on a royalty basis, but the Government refused the offers.

FIRST RUBBER FACTORY

FOREIGN capital, chiefly American, will form one-fifth of the Rs.5 million State-sponsored factory in Ceylon for the manufacture of high-grade tyres and other heavy rubber products. The Government will hold 6 per cent cumulative preference shares for another Rs.1 million and the balance of Rs.3 million will be subscribed by private local capital.

The new factory will be the first of its kind in Ceylon to undertake the manufacture of heavy rubber goods, car, lorry and truck tyres.

It will also undertake the production of processed rubber such as Pliofilm, carbon black rubber and other varieties of processed rubber which have a ready market abroad.

This enterprise is also the first in which the Ceylon Government is associated with foreign and local private capital. The foreign investor in the new factory is the General Tyre and Rubber Company of America, which has established similar factories in many countries. The American company will also provide the technical experts.

CRYSTAL COLOURINGS

Italian Studies of Anomalies

IN her paper presented to sections of the Italian Chemical Society Gilda Cavicchi recorded some interesting anomalies in the colouring of mixed crystals, especially cyanides of the platinum metals.

Mixed crystals formed from coloured and colourless salts usually have the same colour as the former, in lighter shade. A special case is that of salts which are coloured only in the solid state, *e.g.*, some platino-cyanides.

Recent research by G. A. Barbieri (Accad. d. Scienze di Bologna, 1948) has shown that the mixed crystals formed of barium platinocyanide with barium palladocyanide—the latter being colourless—have not the yellow colour of the platinum salt, are green and more fluorescent.

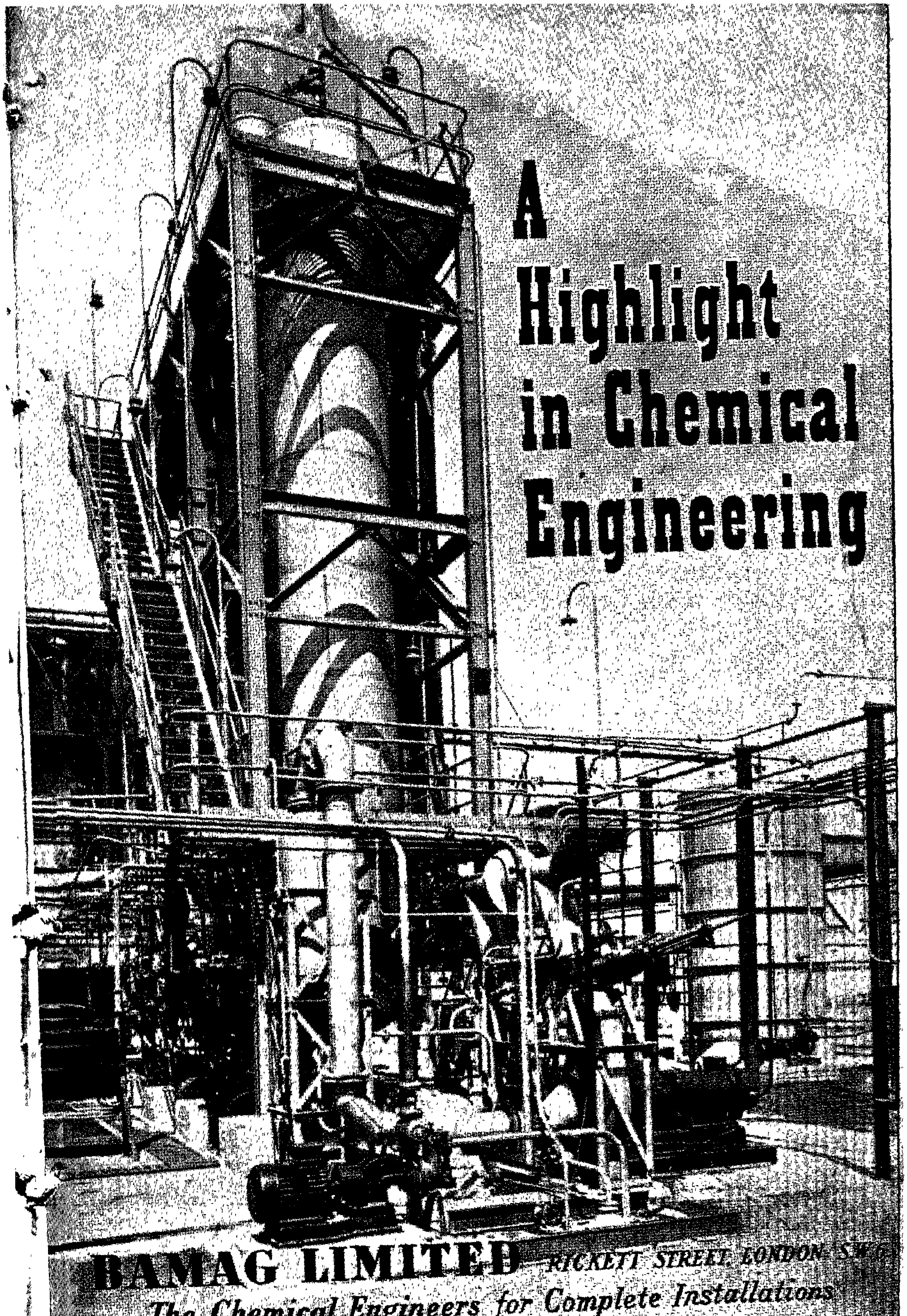
Colour Changes

It was thought of interest to study other platinocyanides in this connection, notably the Mg salt, $MgPt(CN)_4.7H_2O$, which has an intense strawberry red colour, with greenish-blue metallic reflections and is not fluorescent either in ultra-violet or X-rays. The MgPd cyanide has been previously described as a non-fluorescent colourless salt, with four molecules of water of crystallisation.

The author has found that crystals of this Mg salt heated to 100°C. lose 4 mol. water; but analysis still corresponds to the formula with 7 mol. water—$MgPd(CN)_4.7H_2O$—similar to that of the Pt salt. This agrees with the result obtained, namely, that this MgPd salt forms mixed crystals in every proportion with MgPt cyanide. Their colouring is anomalous. 1.8 per cent by weight of the Mg palladium cyanide suffices to change the strawberry red colour of the corresponding platinum salt to orange red, and, with further additions, to orange and yellow. The mixed crystals were all more or less fluorescent with X-rays. It would be of interest to supplement these findings with quantitative optical tests. (*La Chim. et l'Ind.*, 1949, *31* (6), 204-5.)

Spectrographic Analysis of Bronze

A new spectrographic method of analysis of bronze alloys has been announced by Dr. Berta and Dr. A. Palisca, of the Fiat Company's research laboratories. Experiments with the use of a courtez-electrode of very pure bismuth are reported to have given good results in determining the percentage of tin, lead, zinc, etc.


A Highlight in Chemical Engineering
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The Chemical Engineers for Complete Installations

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Chirnside Lime Co., Newcastle-on-Tyne. (M., 10/9/49.) August 5 debenture, to Olds Discount Co., Ltd., securing all moneys due or to become due to the holders; general charge. *Nil. Dec. 27 1948.

Satisfaction

Harefield Lime Co., Ltd., Cowley, Middlesex. (M.S., 10/9/49.) Satisfaction August 8, £396, registered June 6 1941.

Company News

The directors of Boots Pure Drug Co., Ltd., have declared an interim ordinary dividend for the half-year ending September 30 of 10 per cent, less tax.

Increases of Capital

The following increases in capital have been announced: C. C. Wakefield & Co., Ltd., from £2,284,375 to £3,137,500. Fairbank Kirby, Ltd., from £8000 to £12,000. Thomas Hedley & Co., Ltd., from £500,000 to £1,000,000. J. C. Gilbert, Ltd., from £10,000 to £15,000.

New Registrations

Ashford Paint and Cellulose, Ltd.

Private company. (472,328). Capital, £2300. Manufacturers of and dealers in paints, colours, varnishes, lacquers (transparent or pigmented), cellulose products, and solvents, bituminous paints, etc. Directors: A. O. Hughes, J. E. Hughes and L. G. Palmer. Reg. office: 15 Wellesley Road, Ashford, Kent.

Canadian Waxes, Ltd.

Private company. (472,368). Capital, £1000. Manufacturers, producers, refiners, distillers of petroleum and petroleum products and oils and oil products, lubricants, motor spirit, tar, bitumen, wax, beeswax and oil fuels. Directors: W. Reucassel, A. P. Glover and F. N. Glover. Solicitors: Beaumont & Sons, 380 Gresham House, E.C.2.

Dextran, Ltd.

Private company. (472,374). Capital, £100. Manufacturers of plasma substitute and biological preparations of all kinds, etc. Directors: T. F. J. Collins, T. C. Usher. Reg. office: Street One, Aycliffe, Darlington.

Kloryde Chemical Company, Ltd.

Private company. (472,221). Capital, £4000. Manufacturers of chemicals, bleaching powders and liquids, etc. Directors: A. Gardner, F. Jackson and Wm. C. Gardner. Reg. Office: Weedon Road, Northampton.

A. C. Post & Company (Cornwall), Ltd.

Private company. (472,326). Capital, £7000. Objects: To acquire the Plymouth branch of the business of agricultural merchants carried on by Gerald Glanville, Ltd., at Lockyer Quay, Sutton Road, Plymouth; manufacturers of artificial manures, manurial products and fertilisers, etc. Directors: A. C. Post, L. J. Post. Reg. office: Pensilva, Liskeard, Cornwall.

Verity Chemical Products, Ltd.

Private company. (472,396). Capital, £300. Manufacturers of bleaching, washing, cleaning, scouring and similar powders and preparations, chemicals. Directors: F. R. Bartlett, J. W. Fisher. Reg. office: c/o Fisher (Portsmouth), Ltd., Haslemere Road, Southsea, Portsmouth.

South African Sea Salts

THE factory designed to produce £500,000 worth of salts and metals from sea water annually has been completed at Jacob's Bay, four miles north of Saldanha Bay, South Africa.

The new plant, the first of its kind in Africa, is financed entirely by South African capital. Its annual production is expected to be 100,000 tons of different grades of salt, 36,000 tons of magnesium which will more than meet South Africa's needs, 700 tons of potassium, and 200 tons of bromine.

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The Stock and Chemical Markets

HOPES of a satisfactory outcome to the Washington talks have maintained firmness in markets, British Funds showing further improvement on balance, and industrials with dollar export prospects recording numerous gains.

Chemical and kindred shares reflected the better trend of markets, although generally movements on balance have not exceeded more than a few pence. Imperial Chemical have been firm at 44s., at which the yield is 4½ per cent on the basis of last year's 10 per cent dividend. Monsanto 5s. shares strengthened to 50s., Albright & Wilson were firm at 27s. 6d. awaiting the interim dividend, Boake Roberts were 28s. 9d., Brotherton 19s. 6d., F. W. Berk 12s. 6d., Amber Chemical 2s. shares 4s., and Bowman Chemical 6s. 9d. British Chemical and Biologicals 4 per cent preference have changed hands around 19s., L. B. Holliday 4½ per cent preference were 20s. 6d., Sanitas Trust 33s. 6d., and Pest Control 5s. shares 8s. 3d. In other directions, both Laporte Chemicals 5s. ordinary at 20s. 6d., and William Blythe 3s. ordinary at 21s. have remained firm on the share bonus announcements.

Expectations of a better volume of trade with the U.S. has continued to draw attention to United Molasses, now 38s. 7½d., and Borax Consolidated, which rose further to 57s. 6d. The 4s. units of the Distillers Co. were 27s. 3d., Turner & Newall 76s. 9d., but Levers at 42s. 9d., and Lever N.V. at 44s. 9d. failed to hold earlier gains. The big capital plans led to profit-taking in Fisons ordinary shares, which fell to 37s. 6d.

Elsewhere, British Xylonite were good, advancing to 77s. 6d., but De La Rue receded to 25s. 6d. British Aluminium (43s. 3d.) and British Oxygen (93s.) have been firm.

News of record exports of cement last month put Associated Cement better at 74s., while British Portland were 71s. 10½d. Business around 14s. was recorded in British Plaster Board, Goodlass Wall firmed up to 30s. 9d., and paint shares generally were more active—Lewis Berger 4s. units standing at 25s. 9d. Metal Box shares have been firm at 95s. Triplex Glass were steady at 18s. 6d. awaiting the full results and chairman's statement.

Iron and steels improved. Dorman Long to 30s. 3d., Colvilles to 33s., Hadfields to 25s., while Consetts at 13s. 7½d., and Stewarts & Lloyds at 52s. 9d. were also better. If the nationalisation proposals were dropped there would, according to the City view, be good prospects of dividends being maintained; and on this basis the shares offer good yields.

Boots Drug strengthened to 50s., Beechams deferred held their recent improvement to 13s. 3d., Sangers were 27s. 9d., Griffiths Hughes 18s., and British Drug Houses 5s. shares changed hands around 6s. 10½d.

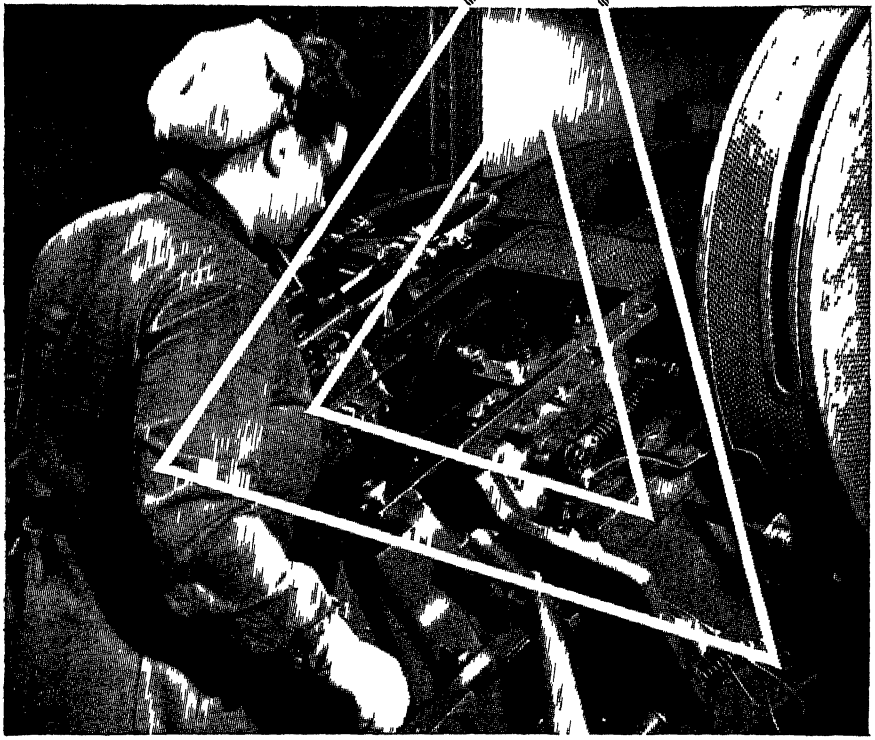
Market Reports

A MODERATELY active interest has been maintained in the chemicals market during the past week, and the movement to the chief consuming industries has continued on a fairly satisfactory scale. The only price alterations of note are those of the lead oxides which have been decreased by £1 per ton, due to a reduction in the controlled price of linseed oil, and the rise of approximately £2 6s. 6d. per ton in zinc oxide values. Among the soda products there is a steady demand for caustic soda, chlorate of soda and bicarbonate of soda and conditions in the potash chemicals section are unchanged.

MANCHESTER.—Prices of alkalis and most other leading chemicals have been maintained on the Manchester market during the past week and such changes as there were have been of little consequence. Home-trade users are taking steady deliveries against existing commitments and new bookings during the past few days have covered fair quantities in a wide range of products. Shippers' inquiries on export account have also been on a satisfactory scale. Trade in some of the fertiliser materials for the current season's requirements is gradually opening out, but in the market for the tar products business in respect of a number of items is described as dull.

GLASGOW.—The Scottish chemical market has been fairly active during the week and has revealed fairly good demand for formaldehyde, particularly for horticultural purposes. No further outstanding demand has been noted, but all classes of products have been fairly well absorbed. The position seems to have become stabilised on this basis, although during the current year there has been a gradual increase in demand for chemicals required by new industries. This particularly has affected toluol, xylol and the main acids.

SAFETY in industry



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P 341

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Oxidation of aldehydes and ketones.—Distillers Co., Ltd., A. Elce, H. M. Stanley, and K. H. W. Tuerck. Dec. 8 1944. 628,034.

Electrolytic cells.—I.C.I., Ltd., and A. W. Ravenscroft. Sept. 17 1945. 627,967.

Manufacture of acetic anhydride.—Distillers Co., Ltd., A. Elce, H. M. Stanley, ley, and K. H. W. Tuerck. Dec. 8 1944. 628,035.

Continuous distillation of solvent or volatile liquids.—Sutcliffe, Speakman & Co., Ltd., and W. E. Edwards. Feb. 26 1946. 627,838.

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Production of highly-concentrated solutions of alkali hydroxide.—I.C.I., Ltd. March 9 1946. 627,767.

Production of alcohols by reduction of aldehydes.—Institute of Paper Chemistry. May 17 1944. 627,769.

Production of vinyl cyanide.—E. I. Du Pont de Nemours & Co. March 30 1946. 628,023.

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Process for the refining of volatile metal or silicon chlorides. — Sourefabrik Schweizerhall. June 27 1946. 627,904.

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Manufacture of organofluorosiloxane products. Dow Chemical Co. July 8 1946. 627,800.

Process for protecting metals against corrosion, anti-corrosive packing material and the manufacture thereof.—N.V. De Bataafsche Petroleum Maatschappij. May 7 1946. 627,801.

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Re-shaping German Industry

THE first significant examples of opposition, carried to the extreme of violence, to the Allied programme for removing the teeth from German chemical industries appear to have been short lived. The fact that last week dismantling was going according to plan at the Ruhr Chemie A.G. at Oberhausen, Holten, in the Ruhr, where, in 1934, the principles elaborated by Franz Fischer and Hans Tropsch were given their first industrial application, has encouraged belief that the dismantling programme is not likely to encounter further impediments. Such optimism is manifestly unwarranted. Those nearest to the scene of operations are not deluded, in evidence of which there was the warning which the British High Commissioner, General Sir Brian Robertson, issued when he discussed the situation last week in Hanover with German trade unions. Repudiating the claims, of which much have been made, that the present dismantling was a serious blow to German economy which would cause continued unemployment, he acknowledged that trade union leaders "had been far wiser in these matters than some of their fellow countrymen."

That recognition tacitly suggests the source of a great deal of the "spontaneous" resentment now being exhibited and of the charges that the United Kingdom, the U.S.A. and others are animated by the desire to gain commercial advantage in the field of chemical production. German industrialists and some chemists—not the man in the street—are fairly evidently the chief sponsors of the agitation and have set out on a course of dogged opposition. which they will not lightly abandon while there is even a remote hope that propaganda may at least bring a change in Allied plans for German chemical industry. The record of many German industrialists under Hitler's regime showed that not all are troubled by scruples, and there is in the present pleadings for a reversal of the Allied decisions no evidence that a realistic recognition of the limited value of the Fischer-Tropsch plants in a peaceful economy or of any other of their shortcomings is being allowed to weaken the case.

The value of the three Bergius (high-pressure) plants and the six Fischer-Tropsch plants in Western Germany was most evident in the period 1939-1949 (when the massive bomber offensive brought their work to an end) as producers of rather less than 600,000 tons of oil from coal, or about 8 per cent of Germany's total oil production, and of motor and diesel oil and some fatty acid products. As producers of petroleum to compete with the im-

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ported product, the Fischer-Tropsch plants are economically not interesting. Now the price of coal has increased much more extensively than that of hydrogenated products, the high-pressure plants, too, are not competitive. The attitude in Germany, however, is that these and associated supplies are so urgently required, in Germany and elsewhere, that capacity to produce must be the main criterion.

One of the most skilful presentations of the case in general has been made by Dr.-Ing. Heinz Nedelmann, director of the Coal Chemistry Technical Association (*Chemische Industrie*, *1*, 62-64.) He claims that, under existing plans, Germany will have a refining capacity incapable of processing the 4 million tons of crude oil which it is considered will be essential to German economy in 1952-53. The Gelsenberg Benzin A.G., one of the "banned" plants, would have been able to handle the 1 million tons of crude annually. Dr. Nedelmann seeks to dispose of the argument that the German coal hydrogenation plants are not economically practical by claiming that big economies in the treatment of crude oil could be achieved by invoking the aid of the hydrogenation process. He suggests it would be possible to save $10 per ton of crude, and that three of the condemned hydrogenation plants could together save exchange equivalent to $20 million a year.

A substantial part of the German specialists' arguments rests upon the need for other hydrogenation products, especially the synthetically produced fatty acids. They are not deterred by the knowledge that values of natural oils and fats are falling and that intense shortages are a thing of the past, and prophesy that the needs of their soap and allied industries cannot be assured of adequate materials now or in years to come without recourse to the native synthetic equipment. That does not accord with all the facts.

Many in Germany are known to share the hope which has been voiced by Nedelmann—that opinion in this country and America can be marshalled against the demolition policy. It has yet to be shown, however, that such intervention would in the long run be of benefit to German economic prospects or that the ingenuity of German chemists, diverted into other channels, will not produce much more valuable conceptions—with a less intimate association with warlike needs.

Notes and Comments

Enterprise

IF evidence had been wanting of the dynamic forces which still find their most effectual outlet through "private enterprise" some of the events of the week would provide all that was required. While the characteristics of two of the more conspicuous examples—the opening by I.C.I., Ltd., at Wilton of great new sections of plant with impressive potentialities (page 381)—and the collaborative plan to place much more British machinery in Canadian markets (page 394) are highly enterprising and anything but private, the loose description as private enterprise serves well enough, indicating that they owe little or nothing to State planning or administrative decisions. Both those undertakings hold out more promise of promoting a healthy economy than it is common to find in anything normally emanating from Whitehall. A lively appreciation of that point may have moved the I.C.I. chairman to drop for a moment his customary non-partisan outlook to remind the company's guests at Wilton this week how fruitless under Government auspices would have been the inspiration which is now leading into great new fields of chemical production. As Lord McGowan knows well, as do all others who have shared similar experience of initiative in chemical affairs, here there are no precedents or departmental minutes for guidance, nor could there be any acceptable Parliamentary answer to the host of critics of a proposal such as I.C.I's. to spend £22 millions—as a start—in implementing intangible ideas.

Plant for Canada

THE current proposals to press home every advantage that market investigation and co-operative salesmanship can secure for British plant and machinery in the potentially rich markets of Canada are a decidedly heartening example of the self help, on the national scale, of the sort of which the associated chemical plant manufacturers and a number of other trade groups have made good use individually. Some congratulation is owed to the Government in this regard for the perception which has permitted the offer of loans, if required, towards the support of this sales campaign, the need for which was made very plain by the U.K. Engineering Mission on its return from Canada last autumn. Makers of chemical plant and equipment are entitled to perform a very important part in future operations in Canada, regardless of the more obvious advantages of the neighbouring chemical plant producers of the U.S.A. Some of the evidence in support of that was conveniently mustered by American chemical engineers in congress in Canada last week, underlining the vast potentialities of Alberta and some other States for chemical production, if fuller use is made of great natural resources, notably coal and massive water power and opportunities for fertiliser production. Canada, however, is not alone in affording great scope for British chemical plant, as the official record of international sales of "gas and chemical machinery" testifies. The return in July, for example, was £340,338—more than twice the value recorded in 1947—and the total for seven months, £2,105,565, showed proportionately the same rate of development. It is still necessary to queue for some categories of chemical plant.

Soap Economics

THE position of the soap manufacturer all over the world has undergone considerable change in recent times as a direct consequence of the competition offered in certain sections by the comparatively large number of synthetic detergents now on the market. In this country, a further factor has lately complicated the economics of soap manufacture, the industry having now been freed from most limitations of governmental control. This much desired event, however, brought its own problems to certain sections of the soap manufacturing trade. Prior to the relaxation of control, a number of small firms of recent growth had been making a living by supplying particular needs; this especially applied to the manufacture of household soaps. Now, with the freeing of raw material supplies, these firms find themselves at a distinct disadvantage in relation to the larger soap firms, capable of exercising some degree of raw materials sources. It would appear that a large amount of the pre-war volume of trade is reverting to the groups, both in household soaps and toilet lines. The manufacture of synthetic detergents is equally subject to the hazard of increasing competition, and current information indicates that the plans for expansion of a number of the smaller undertakings are being given at least a second thought on this account.

Little and Good

CHEMICAL literature is fertile in producing almost unimaginable concepts, yet seldom does it conjure up anything as strange as the recent announcement of a method to produce "little hygroscopic good looking calcium nitrates." That was met lately in the official *Journal of Patents*, whose responsibility for rendering intelligible the basic facts of foreign workers' "patents open to public inspection" demands qualities more fitted for a United Nations interpreter. It is a pity the explanation is probably so prosaic, forbidding flights of fancy which the enlivening entrance of such picturesque additions to the heavy chemical group would seem to invite. Some classical experiments in the hands of the adept and stylist legitimately have earned the epithet elegant, but even the electron microscope has so far proved incapable of revealing any of the fertilisers as winsome little objects.

Competing Claims for Research Staffs

CONCRETE evidence of the heightened competition for the more able workers required for scientific research in its many departments has been provided by Dr. W. K. Slater, secretary of the Agricultural Research Council, who has drawn attention also to the problem represented by the disparity between the remuneration which different branches of research can offer.

Dr. Slater, describing recently before the Parliamentary and Scientific Committee the work and plans of his own research council, said that one of their worries was the difficulty in getting first-class people. In spite of the increased numbers that were going through universities, there did not seem to be an increased number of first-class workers. This was rather alarming, because one of the problems was what to do with lower quality scientists.

The council had to consider how many of these people could be carried, and how best they could be carried to produce useful results. Dr. Slater felt that the agricultural research workers had not had a fair share of higher grade people in the past. Medical work had previously had a greater attraction for scientists than agriculture.

The council was disturbed by the very rapid rises in salary rates, particularly in medical work and universities. Until they could get some adjustment for the people in the Research Institutes, they were likely to lose some who had common interests with medicine, and their recruitment was likely to be hampered. It was no use assuming that scientists were not interested in money. In present financial circumstances, they were bound to be interested.

In its direction of research projects, the council noted that the brilliant research worker needed neither direction or control; all that was required was to make his path easy. Unfortunately, he turned up only too rarely, and the majority of research workers required varying degrees of control, both in the allocation of funds and in the direction of effort.

NEW CENTRE OF CHEMICAL INDUSTRY

Decisive Stage in I.C.I's Wilton Plants

THE completion of a further important stage in the development by Imperial Chemical Industries at Wilton, Tees-side, of " a centre of modern chemical industry to which the world's scientists may well pay pilgrimage " was signalised on Wednesday by a reception at which the Press and a large body of specialists were given facilities to examine this giant group of chemical installations.

The foregoing description of what Wilton may represent when further stage in the £22 million development to yield many new or uncommon chemical materials are completed was given by the chairman, Lord McGowan, following an inaugural luncheon. The chairman reviewed at full length what has been achieved on the 2000-acre site in what was once the Tees-side " depressed area " and interpreted many of the incidental results, from the point of view of national economics and prestige, likely to flow from "the greatest single project ever in Britain's chemical history."

Freedom to Experiment

He said at the outset: " This is not an occasion for expressing political views, but I cannot refrain from making the observation that I cannot conceive of Wilton, as we visualise it. being undertaken by a nationalised company. While, by and large, we are following an established practice elsewhere, here we are in some directions dipping into the unknown, which is a *sine qua non* of the progress and success of a company of the size and importance of ours, and with such wide ramifications. That being so, it is difficult to imagine such a vast scheme as the one in which we are involved not coming under some form of public criticism, such as a Select Committee on Expenditure, or even criticism in the House of Commons itself, because of this huge expenditure, some of which is being employed in following up to the manufacturing stage research carried on in the laboratories."

In his view of the stage reached in the present development the chairman said that general site development for the operation of the Stage I plants was well advanced. The main road system was substantially finished, as well as many of the subsidiary roads for the operation of Plastics Division plants and for the construction of the plants for the manufacture of chemicals from petroleum.

Good progress was being made with the construction of internal railways and with the rail connection to the site; the latter would operate about the summer of next year. The main stores were in full operation and the instrument service station was now being brought into use.

Power Plant

The foundations for the power station were now being constructed, but owing to the long delivery period for the high-pressure coal-fired boilers and the turbo-alternators the first units will not be in operation until the spring of 1951. The steam requirements of the site between now and then could be met by the two intermediate-pressure oil-fired boilers, the official trials of which are due to start on 19 September; and the electrical requirements were being met by a link with the public supply, the capacity of which was being increased in steps to 30,000 kVA when it would be enough to serve as standby to the generators to be installed in the Wilton power station.

The first two divisional plants to come into production, the chairman continued, were the Plastics division's plants to make respectively Perspex sheet and phenol formaldehyde (PF) moulding powder. In the Perspex plant, production at a limited rate had already started, and the whole of the plant should be complete by the end of September.

More Perspex

Additional capacity for Perspex was required to meet increases in home demand, and an export trade which has grown from nothing to something like £¾ million annually. In addition to direct exports, there are valuable home uses for Perspex in the form of lighting fittings, domestic and hotel fitments, motor car fittings and corrugated roof-lighting material.

On the PF plant, successful operating trials had been in progress on various sections of the process during the past few weeks, but plant erection would not be completely finished until early next year.

Each of the existing plants was firmly based on at least one major activity, and at Wilton it was decided to have two—the cracking of oil for the production of basic organic chemicals and the electrolysis of brine for the production of chlorine and caustic soda.

At Billingham they already had a considerable stake in the production of organic chemicals derived from the hydrogenation of creosote oil. The oil cracker would extend this interest, and would, in fact, provide the basic raw materials for a large new petroleum chemical industry—a new field of chemical activity and one demanding the vigorous application of a technique new to the company.

The intention was to crack hydrocarbon oils imported from the Middle East, breaking down of oil to give simpler raw materials for chemical processes. In the present state of world economy and technical knowledge, petroleum was a much more attractive starting point for such processes.

Sources of Plastics and Textile

Two very important products of the cracker would be ethylene and propylene. Ethylene will be the raw material of polythene plastic, at present made at the Winnington works of the Alkali Division, which originated it. Ethylene glycol would also be produced from Wilton ethylene—as an anti-freeze mixture, and as a raw material of I.C.I.'s promising new textile fibre Terylene.

The happy proximity of Wilton works to the Billingham plant across the river had permitted them to be connected by pipe lines nearly 10 miles long, carried under the bed of the Tees. Through the pipe line propylene will pass to the Billingham plant where it will be converted into acetone via isopropanol. Acetone was vital for the manufacture of Perspex and as a solvent for paint and leathercloth—I.C.I. products with considerable export promise; acetone is also an essential raw material in the manufacture of cordite.

Wilton would also pipe butane to Billingham, where it will be blended in petrol or sold as domestic gas. A stream of mixed hydrogen and methane will also be sent to Billingham to be used to make hydrogen and so save coke in the manufacture of fertilisers.

Finally, the motor spirit from the cracker would also be piped to Billingham for blending with Billingham petrol.

"You may ask," commented Lord McGowan, "what all this means in terms of the national economy. Besides securing the home production of numerous chemical products vital for Britain's future, and our own use, it will also mean a significant saving in dollars. Both polythene and ethylene oxide have hitherto had to be made from molasses, which is largely imported from the dollar area. Finally, we shall have raised the home production of high-quality motor spirit."

The second major activity at Wilton would be the manufacture of chlorine and caustic soda, vast tonnages of which were essential for many basic industries. A capacity would be provided, which, together with existing I.C.I. plants, would take care of the likely demand—home and export—in any foreseeable future.

A huge centre of chemical industry like Wilton required vast quantities of steam and electricity for its operation. Both steam and electric power would be generated from Durham coal, and steam would be used in a way that seemed to disprove the old adage that "you cannot eat your cake and have it too"! Steam would be generated at extremely high pressures, to make electricity by passing through the turbines. The once-used steam would be employed again, at intermediate or low pressures, in the chemical processes.

A 300-ft. chimney, and installations of cyclones and electrostatic precipitators for cleaning waste gases before they go into the chimney, would ensure that Wilton brought no dust or smoke problem.

"When, 3½ years ago, we announced the Wilton project," added Lord McGowan, "we said that our intention was 'to create on this site an industrial enterprise on the most modern and efficient lines, and one which in layout, appearance and amenities will compare favourably with any to be found anywhere else in the world.' I leave you to judge if we have not laid a sound basis on which to build such an enterprise.

Rewards of Research

"I have said that in some directions we are dipping into the unknown, but what we are doing in that connection is due to intensive research during the past years. I have made it public knowledge that our company spends £4 million per annum on research and development; all we undertake under those headings cannot be successful; but I can assure you that that huge outlay has paid us handsomely, and while we may be facing a period of recession in the demand for our products we shall not put a brake on the money we are spending in those directions."

Cheaper Naphthenic Acid

Shell Chemicals, Ltd., announces that the price of its naphthenic acid N.A.17 has been reduced by £5 per ton. Representative new prices are: 40 gal. drums, £68 10s. per ton; 10 tons up, £65 10s. per ton.

Basic Chemicals in June

Levels of Production and Consumption Maintained

PRODUCTION and consumption levels of basic chemicals in June showed little variation, compared with the previous month. There was a slight decrease in consumption below the levels of June 1948, while stocks generally, tended to show an improvement over the same period last year.

Estimated numbers of employed for June showed a slight increase since May in some sections of the chemical and allied trades. Distribution of workers (in thousands) was as follows: coke ovens, chemicals and dyes, explosives 249.2 (182.8 men, 66.4 women); paints and varnishes 37.8 (26.5 men, 11.3 women); oils, greases, glue, etc., 64.2 (51.0 men, 13.2 women); pharmaceutical, toilet preparations, etc., 81.6 (41.0 men, 40.6 women).

These figures and the tables given below are abstracted from the latest issue of the *Monthly Digest of Statistics*, No. 44, August. (HMSO, 2s. 6d.).

	June, 1949 Thousand Tons			June, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	132.8*	132.0	—	129.2*	129.0	—
Sulphur	—	26.1*	95.4*	—	22.0*	86.4*
Pyrites	—	16.0*	70.0*	—	16.8*	70.0*
Spent oxide	—	15.5*	171.0*	—	17.0*	159.0*
Molasses (cane and beet)	9.8	24.9†	288.0	10.9	28.3	192.5
Industrial alcohol (mil .bulk gal.)	1.83	2.12	4.61	1.93	2.3	7.07
Superphosphate	17.6	—	—	16.3	9.3	—
Compound fertilisers	122.1	94.4‡	—	100.1	80.0‡	—
Liming materials	—	432.6	—	—	391.2	—
Ammonia	—	6.53*	5.69	—	6.37	4.93
Nitrogen content of nitrogenous fertilisers	20.56	15.55	—	20.74	19.16	—
Phosphate rock	—	77.4	206.7	—	75.8	192.4
Virgin aluminium	2.65	13.4	—	2.53	14.7	—
Virgin copper	—	29.4	127.0	—	32.6	84.7
Virgin zinc	—	13.6	75.4	—	19.8	51.1
Refined lead	—	13.4	59.6	—	18.0	28.0
Tin	—	1.92	22.0	—	2.26	15.2
Zinc concentrates	—	11.4	31.0	—	14.9	45.0
Magnesium	0.47	0.41	—	0.29	0.36	—
Pig iron	177.0*	—	436.0*	171.0*	—	272.0*
Steel ingots and castings (including alloys)	244.0*	—	1,177.0	232.0*	—	886.0
Rubber: Reclaimed	0.35	0.45	3.43	0.55	0.54	3.96
Natural (including latex)	—	3.46	43.1	—	4.11	135.8
Syhthetic	—	0.05	1.63	—	0.05	2.19

* July. † Distilling only. ‡ May.

Esso's Rapid Headway at Fawley

SINCE construction began, less than three months ago, of the £37.5 million Esso refinery at Fawley, near Southampton, progress has been so rapid that work is already over a month ahead of schedule. This promises well for the attainment of the target date, January 1952, when it is expected that this project to refine over five million tons of petroleum products a year, will be completed.

The first phase of the construction is primarily concerned with building a labour camp. When this phase has been completed by November, a camp for the first 750 resident construction workers will have been provided.

A temporary hospital and an architect-designed cinema for 500, with many other amenities, will be operating by the end of this year, when a total of about 1400 men will be on the site.

Among the preliminaries to construction are the shifting of well over 1 million cu. yd. of earth and gravel, and the drilling of six fresh water wells, each 700 ft. deep. By the time the refinery is completed some five miles of roads and three miles of railway track will have been laid. A large permanent steel-framed building, 800 ft. long and 180 ft. wide, containing all workshops and warehouses as well as many offices, is being erected. By this means unsightly huts and temporary buildings will be reduced to a minimum during the construction period, and a large proportion of the construction force will be able to work under cover.

EUROPEAN CHEMICAL PROGRAMMES

Disproportionate Expansion By Some OEEC Countries?

THE report of the Chemical Products Committee of the Organisation for European Economic Co-operation, just ssued, which is based on its examination of the recovery programmes of the participating countries for the period 1948-1952, contains a note of warning.

This says: " It is necessary to consider well, before carrying into practice the vast schemes for the construction of new plants which the dollar shortage and the increase in demand have led most participating countries to prepare, whether these projects constitute a viable whole and whether they will not result in a level of production for export which those countries which are traditional markets may not be able to absorb because they, too, are equipping themselves."

Alarming Shortages

The most striking feature of the immediate post-war period, says the report, has been the elimination of Germany, as an exporter of chemical products, from the world market in which she formerly held first place. In addition, when one considers the destruction suffered by certain participating countries, together with the general shortage of coal and power, it is easy to realise the alarming shortage of chemical products and fertilisers in most countries. It has therefore been essential to discover a new source of supply in the U.S.A., where the chemical industry has developed considerably as a result of the war.

Simultaneously with the breakdown of European supplies, demand has increased considerably compared with that of the pre-war period. In the case of fertilisers, this is as a result of the improverishment of the soil during the war, and of the efforts made in most countries for increasing agricultural production to cope with the shortage of foodstuffs. In the case of other products, the greater demand has come as the result of technical progress which has greatly increased the various methods of application.

When the national programmes are examined together, the position which will emerge in 1952-1953 is shown by the figures (Table 1), which are, of course, only approximations.

In this table, the figures for nitrogenous fertilisers are given in metric tons of pure nitrogen; those for soluble phosphates in metric tons of P_2O_5; and those for potash in metric tons of K_2O.

The position of sulphur (*i.e.*, total sulphur) presents a picture with an entirely opposite angle, in that estimated consumption is about two-and-a-half times that of estimated production. The figures in Table 2, for those countries from which the committee has received replies, exclude Portugal, which is a large producer.

For the purpose of these estimates pyrites is taken as having an average sulphur content of 45 per cent.

Trends in the development of dyestuffs are indicated by the following figures:—Production in 1947: 82,000 tons; production in 1952-1953: 163,000 tons (of which exports are estimated at 80,000 tons).

It is estimated that the production of plastic raw materials may rise from 151,300 tons in 1947 to 476,500 tons in 1952-1953. This takes into account phenoplast resins, aminoplast resins, vinylic resins, cellulose products (including film base), and all other plastic raw materials.

In a wider survey of the questions involved, it is pointed out that part of the

TABLE 1: INTERNATIONAL FERTILISER ESTIMATES

	1947		Programme 1948-1949		Programme 1952-1953	
	Actual production	Actual consumption	Estimated production	Estimated consumption	Estimated production	Estimated consumption
Nitrogenous fertilisers	1,033,000	1,061,000	1,392,000	1,319,000	2,187,000	1,867,900
Soluble phosphates					3,314,000	2,847,500
Potash	983,000	1,308,000	1,263,000	1,599,000	1,800,000	2,369,000

In metric tons

TABLE 2: SULPHUR PROGRAMME

1947		1948-1949		Programme 1952–1953	
Actual production	Actual consumption	Estimated production	Estimated consumption	Estimated production	Estimated consumption
1,274,000	2,403,000	1,416,000	2,848,000	1,792,000	4,257,000

apparent surplus of production over consumption of nitrogenous fertilisers, as shown in the plans of the various countries, will be absorbed in the manufacture of technical products (explosives, chemical synthesis and plastic raw materials), which some countries have included in their production estimates, and which may be calculated at about 150,000 tons.

Scaling Down

A group of experts from the nitrogen industry in Belgium, France, Norway, the Netherlands, the United Kingdom and the Bizone has examined the absorptive capacity of the participating countries and has considered the experience of the 1947-1948 season and also the first five months of the 1948-1949 season. From their knowledge of the markets, the group has concluded that the figure of 1.9 million tons would probably be too high and should be reduced to approximately 1.7 million tons. However, in view of the urgent need to increase agricultural production in Western Europe, as forecast in the interim report on the joint recovery programme, it is deemed necessary to pursue the examination of this question in close collaboration with the food and agriculture committee.

The Chemical Products Committee decided to form a working party to undertake the task of carrying out a more thorough examination of the production and consumption figures for nitrogenous fertilisers for the year 1952-1953. In its estimate of nitrogenous fertiliser requirements in 1952-1953 the working party should take into account the conclusions reached in the studies undertaken in the agricultural field. If these conclusions confirm that the production of nitrogenous fertilisers in the participating countries in 1952-1953 will exceed these countries' own requirements, it will be necessary to make a detailed examination of foreign markets in order to establish the advisability of a certain number of the suggested extensions.

It should be pointed out that, even before the war, the participating countries supplied nitrogenous fertilisers to certain non-participating countries in which the industry either did not cover or only partially covered the requirements of agriculture. It will be necessary to study the extent to which it will be possible to keep these markets open. It can, however, be stated that certain non-partipating countries, mainly Spain, Argentina, Egypt, India, Australia, which were traditional exports markets, are now equipping themselves in order to satisfy, at least partially, their own requirements.

As regards rock phosphate, the report recalls that the only producer among the participating countries is French North Africa (Algeria, French Morocco, and Tunisia). Production from this area in 1952-1953 is estimated at 7 million tons, and this roughly corresponds to the total quantitative requirements of the participating countries. It is probable that this esimate will be increased considerably in order to make possible substantial exports to non-participating countries.

In addition to the increased output, it is thought that there will be some changes in the grade of material to be produced, *i.e.*, an increased production of higher-content phosphates (65/77 per cent of tricalcic phosphate) instead of low-content phosphates (58/65 per cent). Thus production will then keep abreast of changes in demand.

In regard to potash, the following measures are thought necessary—apart from supplies of power—for the achievement of the production estimates: Intensive mechanisation of the mines; application of new methods for treating crude salts; and repairs to war damage.

Apart from potash and sulphur, the report states in a chapter devoted to conclusions, the participating countries should by 1952 be in a position to meet, and possibly exceed their own requirements.

Detailed study of the factors involved has shown that, if situations similar to those existing before the war are to be avoided—particularly as regards nitrogen dyestuffs—in some instances there is need for extreme caution when setting up new capacity.

Further Investigations Projected

Finally, it is thought necessary to undertake additional studies in connection with some of the problems considered. These can be divided into two groups: (1) Surplus production in the participating countries: nitrogenous fertilisers; soluble phosphates (with the possible effects on the production of rock phosphates); dyestuffs. (2) Deficitary production in the participating countries: sulphur (in liaison with sulphuric acid and soluble phosphates).

In addition, it has been considered desirable to begin the study of a new problem which has already been touched upon, namely chemicals derived from oil, so as to determine upon the best possible conditions for this new industry from its start.

The Scottish Industries Exhibition

Wide Range of By-Product Chemicals

ALTHOUGH essentially concerned with steel production, the Colville Group in Scotland has a very considerable interest in the by-products deriving from its manufacturing programme, as exemplified at the Scottish Industries Exhibition, in Glasgow, which closed to-day. Its existing range from Tollcross Works includes benzol, naphthalene, tar, toluol and xylol. Its display in Glasgow throws interesting light on original work which has been done to enlarge the industrial by-products of steel production, such as the new concrete aggregate.

Variety of Products

The range of production of the Distillers Co., Ltd., in the chemical and allied fields was also demonstrated. Each of the major companies in the group was represented in the exhibit, revealing how widely the manufactures of the various undertakings are spread in the industrial field, from plastics to insecticides, dyestuffs and aspirin and the expanding yield of antibiotics.

Imperial Chemical Industries, Ltd., had a composite exhibit of the products of its several units in Scotland, including the Nobel Division at Ardeer, which is devoted to the manufacture of explosives and, more recently, to the development of the new fibre Ardil. In this connection the company is building a new factory at Dumfries, where production of Ardil will be developed in due course. Other I.C.I. Scottish units cover paints, metals, pharmaceuticals, and dyestuffs, the latter at Grangemouth being of major importance.

Detergents

Progress in the synthetic detergents field in Scotland was also well demonstrated. John Paterson & Co., Ltd., of Glasgow, makers of the soap-based Clensel, has added to its productions a new chemically-based detergent, Verdol.

Irano Products, Ltd., who introduced Iranopol some 18 months ago, has now altered the name of this to By-Prox for the domestic market, and Comprox for the industrial market. Competition in this field in Scotland is increasing, with the advent of a number of new synthetic detergents made by Scottish firms.

The Hunter Machine Co., Ltd., exhibited its patented Hunter emulsifier. This is claimed to be the only machine yet produced which mixes, emulsifies and homogenises in one unit, and at the same time. The unit is now being supplied in its latest form to the food, bakery, chemical, pharmaceutical and paint industries, and expansion of the plant at Nitshill has become necessary to meet the expansion of business.

Timber Substitute

A section of a structural steel building was included in the exhibit of Fredk. Braby & Co., Ltd., incorporating copper roofing used in conjunction with wood wool slabs. With this roofing method, timber is almost entirely superseded, and the roof is claimed to have very high thermal insulating quality.

The Cintel industrial electronic metal detector was exhibited by Cinema-Television, Ltd. This is an automatic inspection apparatus for the detection of metal inclusions in chemicals, plastics, toilet preparations, rubber, food, etc. Also included in this exhibit were oscilloscopes for laboratory and industrial use.

New Service Laboratory

THE wider use of synthetic detergents and wetting agents and their introduction into new fields is the object of a new department, a customer service laboraory, which the technical service department of Shell Chemicals, Ltd., has opened at Imperial House, Manchester Road, Bradford. The laboratory will be equipped with advanced apparatus for dealing with problems relating to wetting and detergency and the application of Shell chemical products in the dyeing and finishing sections of industry.

The new service is intended to provide rapidly any information needed relating to the uses of the established products such as Teepol and Lensex, with the further aim of assisting users as fully as possible in applying new and improved methods of utilising these materials on a bulk scale.

The chemist-in-charge will be Mr. G. Keighley, who has had some 20 years' experience in process control, analysis and research work, both in textiles themselves and on the auxiliary products used. He will be assisted by a team of technicians.

COMBUSTION CONTROL OF LIQUIDS

Attempts to Secure a Harmless Inhibitor

EXPLORATION of the behaviour of certain oils in small scale fires and the behaviour of combustible liquids under fire conditions without large-scale trials are given in "Fire Research, 1948," the report of The Fire Research Board, published for the Department of Scientific and Industrial Research and Fire Offices' Committee (HMSO, 1s. 2d.).

The burning of a variety of oil products in large tanks of 40 to 6000-gal. capacity has been the subject of earlier reports (Fire Research Board, 1947, and the *Journal of the Institute of Petroleum,* 33, 158-85).

In experiments in vessels ranging from 3 to 9 in. in diameter, with a number of oils of the hot-zone-forming type, the phenomenon of hot-zone formation was reproduced on the laboratory scale when the tank was not less than about 7 in. in diameter and was well lagged to eliminate undue loss of heat from the walls.

When the size of the tank was further reduced or the tank was not sufficiently lagged the definition of the hot-zone decreased and in extreme cases no formation of hot-zone could be detected.

The rate of formation of hot-zone varied with the scale of the experiment, as shown in the accompanying table:—

VARIATION OF RATE OF FORMATION OF HOT-ZONE IN POOL FUEL OIL (STANDARD BATCH) WITH SIZE OF TANK

Diameter of vessel	Rate of assimilation of cold oil into hot zone	
	in./hr.	lb/ft^2/min
3 in.	3–5	0.2–0.3
7 in.	5	0.4
22 in.	9	0.7
9 ft.	14	1.1

The report observes that fires in liquid fuel storage installations present a special hazard, the method of dealing with which will depend both on the fuel itself and on the type of installation. In the last annual report some details were given of the results of experiments on the inhibition of the combustion of certain pure compounds by the addition of a volatile inhibitor to the liquid phase.

Under these conditions the effectiveness of the inhibitor depends not only on its capacity to prevent flame propagation when present in the vapour phase, but also on the relative volatilities of combustible and inhibitor which determine the concentrations in the vapour phase. It is possible with a given liquid combustible to select an inhibitor with a much greater vapour pressure so that in some mixtures of the two the vapour in equilibrium with the mixture is non-inflammable although the vapour of the same composition as the liquid phase would be inflammable.

The possibility therefore exists of protecting liquid fuel installations by the addition of an inhibitor to the fuel, such that the vapour above the liquid cannot be ignited by a momentary source of ignition, although the liquid is still inflammable on complete volatilisation.

The practicability of protecting typical commercial fuels by this method was fully explored. Aviation spirit and aviation kerosene were chosen as examples of their respective classes of fuels and as likely to present the greatest practical difficulties. The inhibitors used are detailed in Table 2, which shows the concentration of extinguisher (per cent by weight of solution) required to produce a mixture in which the vapour in equilibrium with it will neither ignite nor propagate combustion.

TABLE 2

PERCENTAGE OF INHIBITOR (BY WEIGHT OF SOLUTION) REQUIRED TO YIELD NON-INFLAMMABLE EQUILIBRIUM VAPOUR

Inhibitor	Combustible		
	n-hexane	Aviation spirit	Aviation kerosene
Methyl bromide CH_3Br	21	24	1.5
Methyl iodide CH_3I ...	64	62	3±1
Dichlorodifluoromethane CF_2Cl_2 (Freon 12) ...	(a)	(c)	1.2
Chlorotrifluoromethane CF_3Cl (Freon 13) ...	(a)	(c)	0.3 (b)
Sulphur hexafluoride SF_6	(a)	(c)	(a)

(a) Not tested.
(b) But protection time very short.
(c) No protection could be achieved within the limit conditions dictated by the requirement that the total vapour pressure should not exceed one atmosphere.

The duration of protection was determined by the rate of loss of vapour, since the relative concentration of inhibitor decreased as the mixture evaporated.

The results made it clear that the method is not practicable for aviation spirit with the inhibitors at present available, and is of doubtful practicability for kerosene.

This work was carried out by a member of the Joint Fire Research Organisation, working at Imperial College in the Department of Chemical Technology under the guidance of Dr. A. G. Gaydon. It was undertaken with the object of elucidating the mechanism of flame inhibition by organic halides such as methyl bromide.

In last year's report it was shown that when methyl bromide or bromine was added to oxy-hydrogen flames, the emission spectra of bromide oxide (BrO) and molecular bromine (Br_2+) could be observed.

Iodine Effects

Similar work with iodine and methyl iodide has shown that in the same conditions the corresponding IO and I_2+ radicals were present and the IO bands were sufficiently sharp to enable an analysis to be made, from which the dissociation energy of IO was calculated to be approximately 44 kcal (*Nature*, 1948, *162*, 108).

The halogen oxides were detected in the lower part of the flames; thus indicating that they occurred as a result of oxidation by the oxygen itself rather than by a secondary reaction involving the combustible gases.

The reaction might occur as the result of direct oxidation or through a chain reaction involving the intermediate formation of a peroxide.

An attempt was made to decide this point by introducing the halogens into methyl alcohol flames, since the oxidation of methyl alcohol may be assumed to involve the formation of peroxides. In these experiments the presence of BrO and IO radicals was detected but not that of the ClO radicals.

This work has now been concluded: interesting data on the behaviour of the halides in flames have been obtained but the mechanism by which they extinguish flames has not yet been elucidated.

For this purpose, the observations recorded in this and last year's reports must be supplemented by work on the more purely chemical investigations of the reactions involved. Arrangements have been made for this work to be carried out extramurally at the Imperial College of Science.

The report discloses that the pressure of other work restricted studies of the use of water sprays in fire extinction. Some progress has been made, however, in developing a technique for examining sprays. A micro-projector has been adapted so that spray droplets collected in oil may be photographed immediately, and a micro-second flash unit has been constructed to study the manner in which sprays are produced.

An apparatus has been designed which will enable the production of sprays of known, and approximately uniform, droplet size, and which will permit variation in the size of drops and in the rate of delivery; it is to be used in the extinction of a standard oil fire. The principle of the method is that described by Lane (*Journal of Scientific Instruments*, *24*, 98-101).

Other fire resistance tests of interest carried out during the year included structural aspects of fires in buildings.

At the request of the Fire Grading of Buildings Committee of the Building Research Board and the Fire Offices' Committee, experiments were made to evaluate the hazard of methyl methacrylate sheets when used for windows.

Earlier investigations carried out for the committee, and experience gained from reports of fires in which the material had been involved, had indicated the possible hazard of its use in roof lights, and it was required to supplement this information by investigations to determine the hazard of use in vertical openings.

Comparison with Plywood

It was known that a sheet of this plastic can be ignited by matches, and that once alight it will continue to burn without the aid of supporting radiation.

It was considered desirable that the experiments should also compare the behaviour of the plastic with some well-known combustible such as plywood, and that comparative figures should be obtained for the intensities of supporting radiation necessary to permit ignition by small igniting sources.

Experiments showed that a 0.5 g hardboard brand was the smallest which would ignite a sheet of methyl methacrylate; plywood was not brought to the stage of self-maintained combustion even by an 18 g brand (the largest size practicable in the experiment). Sheets of both materials were exposed to various intensities of radiation for different times and a small pilot flame was moved rapidly over the surface.

Under these conditions methyl methacrylate required a higher intensity of radiation than did plywood. It must be remembered, however, that at this and any intermediate radiation intensity the plastic would have been readily ignited by a small persistent source of ignition.

The Basis of Thermostatic Control

Elements which Determine Instrumental Performance

by LEO WALTER, A.M.I.Mech.E., A.M.I.H.V.E., M.Inst.F., etc.

A PREREQUISITE to understanding of thermostatic control of manufacturing processes in industry is a basic knowledge of plant technology and of thermometry. Temperature measurement is, of course, the basic condition for thermostatic control, so that some familiarity with industrial types of thermometers and pyrometers is necessary.

Control of temperature of an industrial oven, dryer, process tank, etc., introduces additional factors. After the temperature has been correctly measured, a detected overrun or underrun of process temperature is expected to be corrected fully automatically by a temperature regulator. Quite simply, this requires that the measurement of temperature shall be capable of initiating some form of impulse, derived from the detecting element. That impulse must usually be amplified in order to produce power for moving a final, regulating unit. This may be a valve, an air damper, a rheostat, or a relay with motor starters to pumps, fans, and machinery in general. Most measuring instruments for industrial use can be transformed into automatic controllers by adding to their basic measuring equipment a control mechanism and a regulating unit, but not all thermometric devices lend themselves to this adaptation.

Fixed Limits

Automatic control instruments can be simple, or they can be elaborate. Their use depends on working conditions of the controlled thermal process, on the design of the plant equipment and, not least, on the amount of accuracy of control required by the user.

Accuracy of control depends, however, not solely on what a potential user of thermostats wishes. Each heat flow process has, what is called " Controllability," which is an inherent quality of the process. Controllability limits accuracy of control, and renders some processes more controllable than others.

Before a user of thermostatic controllers can stipulate the degree of accuracy he requires, he should make sure that his requirements keep within the limits of the inherent controllability of his plant, equipment and heat flow process. Obviously, the less exacting a user is in his claims for closeness of control, the simpler are the temperature regulators that can be successfully employed.

Unnecessarily exacting claims for accuracy of control lead, therefore, to needlessly elaborate regulator types. On the other hand, it would be wrong to try to control by elementary means a heat flow process, difficult to control and requiring very close control. The choice of the correct controller type approximates to an art, practised by the control expert in close co-operation with the user of regulators.

Basically Simple

The purpose of this article is to familiarise users of temperature regulators with some of the basic principles to enable them to discuss thermostatic control problems more effectively with the expert. Thermostatic control of heat flow processes is not a mystery, and its problems can be simplified, and tackled without using complicated mathematical formulæ. The practical engineer is required to look at a control problem not merely from the production point of view, but also from the control angle.

This might present some difficulty, but for the fact that many control problems encountered in industry can be related to a few basic operations. For example, heating liquid in an open vessel by means of direct steam injection, or alternatively by a steam coil, is encountered in a great number of industrial thermostatic control problems. To that extent, a diversity of operations, such as thermostatic control of dye vats, of detergent tanks of bottle washers, of hot water storage tanks, of syrup tanks in confectionery manufacture are fundamentally identical as far as thermostatic control is concerned.

What is required of a thermostatic valve is simply that it should adapt heat input to a liquid to the actual requirements of the process at any moment. Similarly, control of space heating, of performance by hot air driers, or of furnace temperature are basically identical as far as thermostatic control is concerned. Blending of hot and cold liquids, whether water, oil, or chemical solutions, is basically the same, although the processed fluids may be quite different.

(Continued overleaf)

Appreciation of the basic principles of automatic control permits almost any user to identify the essentials of any simpler control problem encountered in routine work, and in more complex cases to furnish to the control expert all the data which the latter requires.

Process Analysis

One of the first considerations in setting up thermostatic control is whether the temperature to be regulated is independent of other process factors. This very often is the case, and such problems can then be satisfied by choosing the correct type and size of temperature controller and regulating unit. Other control problems require "engineered control," whereby not only temperature but also other related factors have to be controlled; for example, air temperature and humidity in hot air drying, or CO_2-content and air/fuel ratio in combustion control.

Some temperature control problems can be solved by controlling a closely related process factor, which influences process temperature. By controlling the draught of a central heating hot water boiler, for example, hot water flow temperature can be kept constant. When controlling pressure of saturated steam, its temperature is also kept steady, and so on. This is called " indirect " control and is sometimes applied, where direct control is too difficult.

To control vapour temperature in a still apparatus it may be easier to detect temperature changes from the liquor being drawn off than from a thermostat in the vapour space. In the instance of a chemical condenser, the temperature of the cooling water outflow is a measure of the temperature of the cooled liquor, and the thermostat can thus be inserted into the cooling water outlet pipe, instead of into the liquor outflow pipe.

The choice of the correct type of control instrument is not always easy. One heat flow process may permit very good control, while the same plant in another factory may not yield to accurate control, when using exactly the same controller. The reason, which it is intended to illustrate here, is that the influence of process characteristics under actual working conditions is the overriding factor for controllability. Neither the control instrument nor the plant is solely responsible for control results; the way in which both work together supplies the criterion for the choice of the correct thermostat.

This point is not always fully realised, so that the wrong facts are singled out as the cause of failure of control. It is customary to put the blame for failure of control on the instrument, sometimes without reference to the fact that two other important factors operate, namely plant design, and actual working conditions of the equipment. The latter is prone to have an overriding influence on controllability. Often slight alterations of working conditions, or of plant design, may so improve controllability as to make thermostatic control entirely successful.

A heat flow process may effect either heating, or cooling. A "heating medium" may be steam, hot water, gas or electricity and the material to be heated—" the heated substance "—can be solid, liquid, or gas. Thermostatic control of a heat flow process then is required to balance input of heat at any moment with the process demand for heat. This balance can be achieved in various ways.

While the purpose of a thermostatic controller is usually to keep process temperature steady, industrial processing may require that temperature should follow a predetermined time schedule " time-temperature " control or " programme control." Programme control is widely used for controlling heat input into canning retorts, soaking pits, heat treatment furnaces in general and hot air drying of chemicals, etc. Programme controllers are also used to control several process variables, together or in sequence.

Broadly, industrial processes can be classified as batch processes or continuous processes. It is easy to apply the knowledge derived from analysis of a continuous process to batch process applications, and the following therefore deals first with characteristics of continuous heat flow processes.

Time Lags

Process lags play an important part in temperature control problems. For control analysis, a simple heat exchanger has been chosen, transmitting heat from one substance to another through a separating medium.

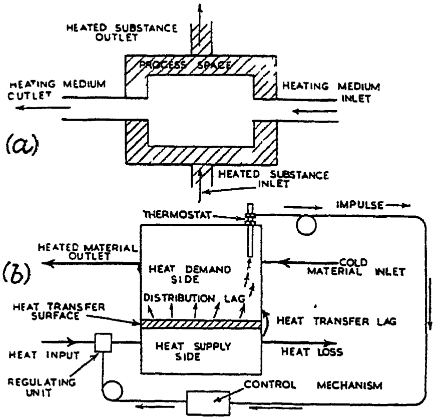
Fundamentally, most processes which lend themselves to thermostatic control can be classified as heat exchanges. Steam-heated calorifiers transmit the heat from steam to water; air heater batteries from steam to air; oil coolers exchange heat from cooling water to the oil; brine coils in cold storage rooms reduce air temperature.

In a broader sense, a dye vat heated by direct steam injection can be regarded as being a heat exchanger, although no separating medium is used between the heating medium and the heated substance.

Fig. 1(a) represents symbolically a heat exchanger, having a separating heat exchange surface between the heating medium and heated substance. The heating (or cooling) medium passes through the lower section, and the top section symbolises the substance to be heated (or cooled). The volume of each section, i.e., the upper and the lower rectangle, represents the heat capacity—B.Th.U. rating. The specific heat of a substance is a measure for absorption of heat per volume unit and per degree of temperature change.

In Fig. 1(b), heat from the lower portion has to be transmitted to the upper section. A separating medium produces some impediment to heat transfer and provision must be made to overcome thermal inertia. That presents two factors: (a) The heat content or heat capacity, and (b) the force necessary to exchange the heat from one medium to the other.

An ideal heat exchanger would theoretically have no time lags and there would be no resistance to the flow of B.Th.U's. In practice, process time lags are unavoidable where heat flows and where changes in heat flow occur, which in turn produce change of process temperature. Disturbance in heat balance of a process has to be counteracted by the thermostatic controller in good time in spite of process lags.



Figs. 1 a and b. Symbolical of a single capacity heat exchanger and (b) the sources of time lags

A practical example of a process analysis shows how process time lags influence thermostatic control. Fig. 1(c) shows a steam-heated hot water supply calorimeter, assumed to have ideal properties and no time lags at all. The following ideal working conditions would be present: Hot water is being drawn off, symbolised by the demand side capacity of Fig. 1(b), thus creating immediately a very slight fall of temperature in the outflow pipe-line, which can be measured by a quick-acting thermometer. For the thermometer may be substituted a thermostat, on the supposition that the latter reacts instantaneously and transmits an impulse for heat supply to a regulating valve, fitted in the steam supply pipe-line, as symbolised at the bottom of the lower cube of Fig. 1(b). An ideal regulating valve would open at once to admit just

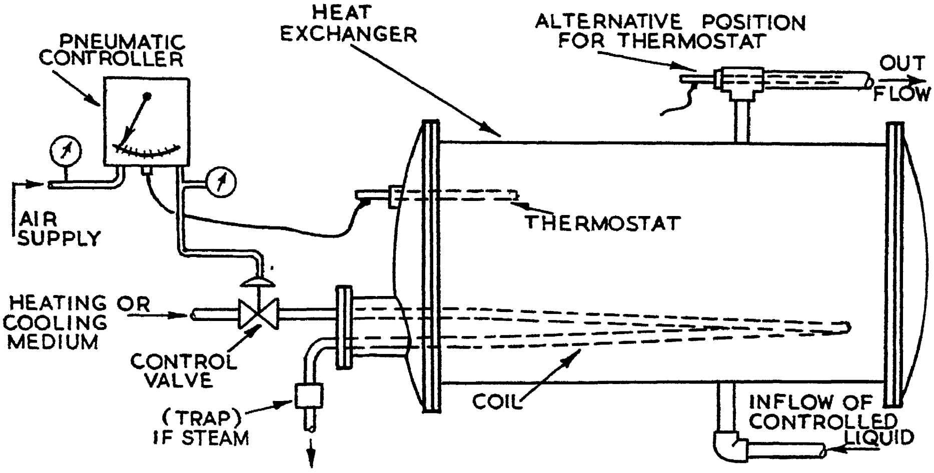


Fig. 1(c). Steam-heated water calorimeter the right amount of steam and heat to the lower section, (supply side capacity). In such ideal conditions the outflow temperature would be quickly adjusted, and substantial variation would occur.

It has been said that the ideal temperature control would be such that the presence of a thermostatic control device would not be noticed at all. This is approximately what would happen in our example. The absence of process time lags and of instrument time lags would make any control problem very straightforward.

The physical properties of materials produce a very different story. Complicating any automatic control problem are obstacles in heat transfer, delays in transmission of movement, mechanical inertia or "hysterasis," and so on. Very seldom is an "immediate" or "very quick" control reaction obtainable. (Even the reaction of a thermocouple without protecting sheath is not instantaneous, although its time lag may be negligible).

Diagram Fig. 2(a) illustrates symbolically the various time lags involved in real heat exchanger, employing water, heated by steam through a steam coil (Fig. 2(b). So many time lags are indicated in Fig. 2(a) as to justify doubt whether control is practicable at all. The following process time lags can be distinguished:

(a) Heat Supply Side Capacity Lag. The supply side capacity is the storage capacity for heat of the heating or cooling medium. In a steam-coil heated hot water calorifier it would be the heat content of steam within the coil plus heat content of the coil metal itself. If sufficiently large, this heat capacity might cause a certain continuation of heating up, even after the regulating valve had fully closed. Not only will the metal continue to give up its heat to the surrounding water, but the latent heat of the residual steam within the coil will also be dissipated through the wall of the coil.

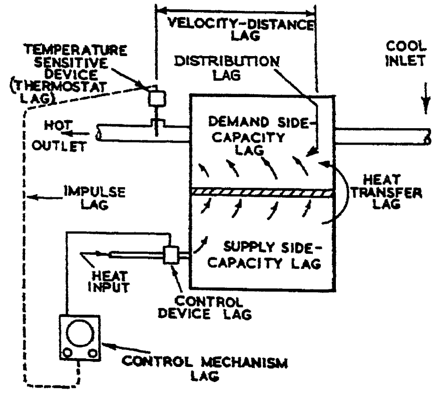


Fig. 2 (*a*)

It is clear that the bigger the heat capacity of the heating or cooling medium, which contacts the separating wall, the bigger will be the time lag resulting from supply side capacity. One of the first considerations in analysing process lags will therefore be to get a true picture of storage of B.Th.U. on the supply side for heat, and of delays of control action caused by the supply side capacity lag.

(b) Heat Demand Side Capacity Lag. Assuming a large storage calorifier (Fig. 2(b)), the demand side capacity will be big—proportionate to the B.Th.U. being stored in the hot water within. Even after the regulating valve has closed and cold water has entered the storage space the heat content within the calorifier will be large enough to continue for a time to supply warm or hot water. The demand side capacity lag is symbolised in Fig. 2(a). In addition, mixing of the hot water content and incoming cold water will take time.

Heat Balance

It is well worth while to find out every detail of the demand side capacity for heat storage, because this can be utilised to obtain good thermostatic control. The larger the demand side capacity of a process the simpler becomes the temperature control problem and the type of control device to be used.

Summing up, it is to be noted that each process, batch process or continuous process, has to be examined as to its supply side and to its demand side time lags; and, before recommending thermostatic control, it must be decided if there is any reasonable heat balance between demand and supply side. This can best be ascertained by applying hand control and noting the reaction of the process to variations of heat supply.

Where the design of the heat exchanger (which may be anything from a calorifier to a complicated space heating system, etc.) does not seem suitable to achieve reasonable control of temperature by hand, automatic control will be difficult, if not impossible.

Simple, self operating temperature regulators will work best in a continuous process, having a large demand side capacity with moderate process reaction rate. The reaction rate of a heat flow process can be measured as the time required to produce a unit change of temperature, effected by variation of heat input.

Constantly varying heat demand and small demand side capacity need more elaborate control devices, with re-set control and stabilising qualities capacity—as described later.

Distance and Distribution Lags

Additional lags are the process distance lag and controller distance lag. As shown in the figures, the material usually flows a certain distance from the heating (or cooling) surface of the heat exchanger to the temperature sensitive thermostat bulb. This flow takes a certain time, depending on the design of the exchanger on thermal conductivity, and also on the position of the thermostat. So we have a distance lag on the demand side. Similarly there may be a distance lag on the supply side, causing a delay in the heating or cooling action of the heating or cooling medium.

Fig. 2(a) shows the existence of two distribution lags, one of the demand side between heat exchanger and thermostat, the other between the heat exchanger and the regulating valve. These two lags are partly process lags and partly controller lags, because they depend not only on the design and on working conditions, but also on the positioning of thermostat and of the regulating valve. In dealing with process lags only, a clear conception of how heat is dissipated from the demand side to the heating surface and to the point where the thermostat is situated, and from the heating surface to the point where the regulating valve has been fitted, will be useful. The smaller the heat distribution lags are, *i.e.*, the quicker any change of heat transmission is transferred to the thermostat, the better for closeness of control.

It will be seen that automatic control problems are very closely associated with the design and working conditions of the process equipment, and a first requirement, when dealing with thermostatic control is to go carefully into the question of process time lags.

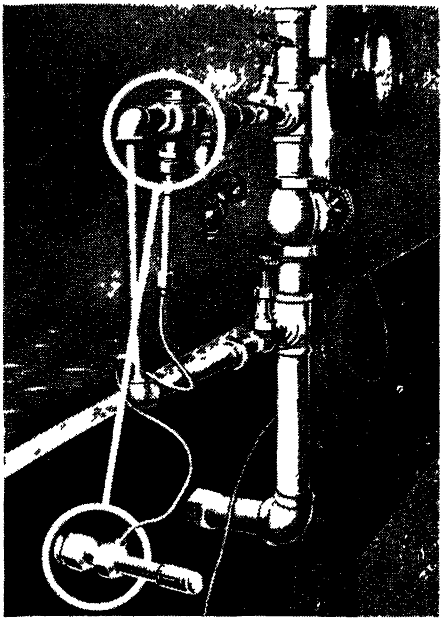


Fig. 2 (c). Controlling and recording steam flow to a large process tank

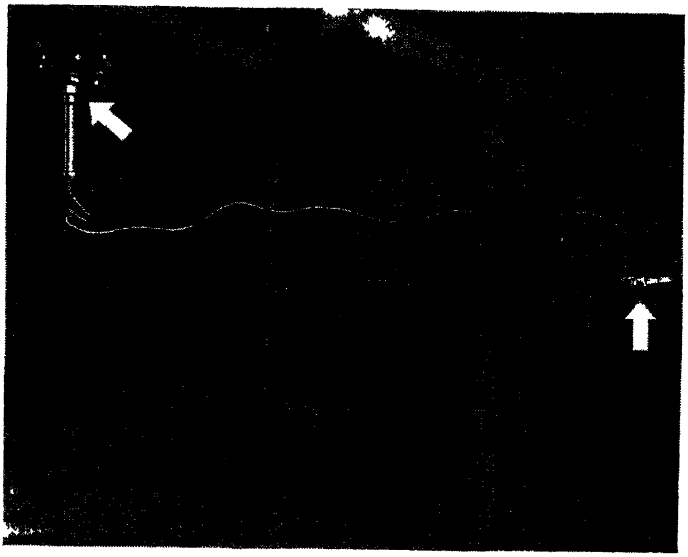


Fig. 2 (b) (*Courtesy of Sarco Thermostats, Ltd.*)

(*To be continued*)

ENGINEERS' CAMPAIGN IN CANADA

Co-ordinating Sales of U.K. Equipment

GREAT opportunities for British engineering in Canada, in machinery equipment and replacement of parts, were stressed by Mr. C. D. Howe, Canadian Minister of Trade and Commerce, when he was guest of honour at the dinner given on the occasion of the opening of the British Industries Fair (THE CHEMICAL AGE, 60, 675).

Mr. Howe pointed out then that of the machinery equipment and replacement parts imported into the Dominion in 1948 £109 million worth came from the U.S.A., and only £7 million worth from Great Britain.

"Expeditionary Force"

An important sequel has been the proposal made last week by Sir Harry Gilpin to the British Engineers' Association implementing some of the findings of the U.K. Engineering Mission to Canada.

Sir Harry said "This meeting has been called to bring into action a new force, to be added to those which have been, and are being, deployed in what we have called 'Operation Canada.' This expeditionary force has come into being as a result of the United Kingdom Engineering Mission last autumn." Sir Harry Gilpin went on to describe the proposals in the following terms:—

The engineering mission reported that there exists in Canada a solid and expanding market for much united Kingdom engineering equipment. We did not minimise the difficulties of establishing it.

I want to impress on you that the attempt at success, and its eventual achievement, are a duty imposed upon us all, to be undertaken without regard to ordinary commercial consideration.

The stark facts are known to all of you. Last year we bought from Canada £216 million worth of goods and produce. Our sales to Canada came to £69 million. "Invisible exports" did little to close the gap.

In our Welfare State the only person whose welfare is nobody's business is the venturer. He has gone forth and the omens for success are favourable.

But the mission realised that the single venturer must have behind him ample funds and, before him, an important market for his goods. Canada is a huge country. Its population is scattered. Its buying centres are strung along a line of 4000 miles, at vast distances from each other.

Further, we were well aware, even before we started out, that the bulk of British export of capital equipment is done by a multitude of small firms, none of which could, by themselves, embark upon a Canadian odyssey.

We applied our minds to this problem in our long trek across the Dominion, and we arrived at a plan, which I put up, in principle, to the President of the Board of Trade, directly we got home.

It is proposed that appropriate sections of the industry should appoint skilled specialists to represent them in Canada for a period of, at least, two years.

These men would not be salesmen. They would travel the country, exploring possible openings, screening potential agents, discussing the long-term needs of users, summing up the chances of group selling organisations and so on, and would report regularly to their sponsors, who would themselves decide on the action to be taken on the specialists' report.

The calibre of man required for the job, and the immense distances he must cover, make the project, necessarily, an expensive one. We calculate the annual cost for each man at £6,000.

This sum would, we believe, cover salary, travelling expenses, and the secretarial service of a headquarters office in Toronto, to which I shall refer later. The representative would, of course, work in close collaboration with H.M.'s Trade Commissioners, but would not be under their control or direction.

Government Loans

Now, there may be some sections, not many, which could raise the required sum from their members, but for most, if not all, it would be beyond their means, and this is where Government aid comes in.

Where a section raises, itself, a minimum of 25 per cent of the cost, H.M. Government will guarantee the balance required as a loan, only to be repaid by a levy of, probably, 1 per cent on the increased sales in Canada by a subscribing firm, during three years from the appointment of the representative. To make the plan equitable, a ceiling for the levy may be set for some firms.

At the end of the three-year period, any deficiency between the cost incurred and the levies raised, will be written off.

The two-year period need not necessarily end the venture. It may be that success is such that a section will decide to carry it on itself. It may be that such a measure of success has been reached that the Government may continue its help.

We have not lost sight of the fact that figures of sales submitted by individual firms for purposes of calculating levy, will be highly confidential, and there must be no disclosure of them.

It is proposed, therefore, that, at a headquarters in London, a chartered accountant of high standing shall be the only person by whom such figures will be seen.

Leaving the financial side of the operation, let us next consider what is to happen to the specialist's reports. These will be sent to the trade association appointing him and will be forwarded, as written, to the subscribing members.

But, as the State is a party to the plan, the Government has laid it down that a general summary of what is being done should be furnished to all those in the section concerned. With apparent inconsistency they oppose the closed shop, but compromise to the extent that the door need only be ajar.

Sharing Information

In Toronto there will be an office for receiving reports and co-ordinating the work of the specialist representatives. Each of these men will, undoubtedly, come across opportunities for his colleagues in the course of his work, and the Toronto office will pass the information along. In our opinion the Toronto office would be run economically and efficiently under the ægis of the FBI, and negotiations have been started for this to be done.

With any kind of response from you, there should very soon be at least ten specialist representatives, in touch with each other through the Toronto office. We shall have spun a web of communications over the whole of Canada.

Although the members of the Gilpin Mission are the initiators of these proposals, it is the sectional engineering trade associations that are called upon to play the paramount part, individually and collectively, to put them into effect.

It is their function to persuade their members to participate in the scheme by subscribing, collectively, a minimum of 25 per cent of the cost involved, to collect these subscriptions and to pay them over to the company, to select their own representatives and to direct and support them.

The British Engineers' Association states it will act initially as the centre for the negotiation of these arrangements, and the following members of the Gilpin Mission place themselves at the disposal of trade associations for detailed discussions:—

Sir Harry Gilpin, Mr. E. Bruce Ball, Mr. A. W. Berry, Mr. D. Maxwell Buist, Mr. A. G. Grant and Mr. Norman Neville.

CANADIAN COBALT PLAN

U.K. Enterprise Launched

STOCKHOLDERS of the Silanco Mining and Refining Company having ratified the sale of the company's smelter at Cobalt, Ontario, to the Cobalt Chemical and Refining Company, the establishment of new British industry in North America is now assured.

Work of the new company, the only major undertaking of its kind, will be partially financed by British capital and will be carried out by British metallurgists and technicians who have had long experience in treating ores of the arsenical type recovered from Cobalt's mines. Under the new management, the smelter will be redesigned and equipped with an electro process for converting concentrates of cobalt, silver, nickel and other metals from the Cobalt mines into oxides, salts, carbonates, sulphides and other chemical derivatives of the metals, including items such as insecticides which will be sold as packaged products.

Under the terms of the sales contract, Silanco Mining will receive for its smelter property one share (nominally $1) in the new company for each dollar that has been spent in building and equipping the smelter. Book value of that expenditure is $850,000. Silanco retains title of its 29 mines and undeveloped properties in the Cobalt area and has entered into agreement with the British interests for priority treatment of its concentrates.

Silver was struck at Cobalt, one of Canada's most historic mining camps, in 1903 and the 20 years that followed more than 300 million oz., valued at $150 million, was taken from the mines. Hundreds of thousands of tons of cobalt ore, discarded by silver miners, have been lying on the Cobalt dumps for more than 20 years. Silver has now become of less interest than the versatile metal.

The Cobalt Chemical and Refining Company will concentrate on developing the chemical products, for which great demand exists in the United States and Canada, rather than on metal production.

THE MINERAL WEALTH OF CANADA

Conference Foresees Large Chemical Developments

THE growth of Canada's chemical industries and their prospects were the keynotes of the regional conference of the American Institute of Chemical Engineers, just concluded in Montreal, Canada. Four hundred leading scientists from Canada, the United States and Great Britain attended the conference—held in Canada for the first time in 12 years.

Alberta's Resources

The source of future Canadian chemical growth was distinguished by J. R. Ronald, of Montreal, as the combination of low cost power sources with abundant chemical resources. That would enable the Province of Alberta eventually to support a large, important chemical industry. He pointed to Alberta's many important natural resources, to the availability of rich agricultural plains and the many large rivers flowing from the Rockies, able to provide cheap power and an unfailing water supply. The underground wealth of the Province consisted chiefly of coal, oil and gas, and included other economic minerals such as salt, limestone, gypsum and potash.

Alberta would become one of the largest oil and gas producing regions on the continent. Immense reserves of natural gas found throughout the Province had taken on a new significance because of the development of economic methods of making industrial chemicals from gas. Alberta might well provide some of the chemical needs of eastern Canada. In addition to ammonia, such chemicals as methanol and urea as well as the chlorinated hydrocarbons should be cheaply produced in Alberta.

The great beds of coal which underlie much of the Province of Alberta have hardly been touched in the past because of the high cost of transport by rail to eastern markets. But the low-cost conversion of coal to liquid and gaseous hydrocarbons now seemed assured, inviting a greater commercial use of these reserves.

Speaking on a similar theme, M. L. Haider, a director of Imperial, Ltd., said that Western Canada is within sight of being able to produce enough oil to meet one-third of Canada's petroleum needs. Alberta's crude reserves were estimated to be in the neighbourhood of one billion barrels, and the fields would be capable of producing approximately 100,000 barrels daily by the end of 1949. This would represent nearly one-third of Canada's present demand. The pipeline from Edmonton to the Great Lakes, now being planned, would help to close the gap between actual and potential production, he said.

The possibility of extracting oil from bituminous sands was explored by W. S. Peterson and Dr. P. E. Gishler, of the National Research Council, Ottawa, who recalled that in Northern Alberta may be found one of the world's extensive oil occurences, the Alberta Bituminous Sands. In one of the richest areas studied, they said, a bitumen content of 200 million barrels per square mile had been established. A large part of the occurence, however, is unsuited for development, due to either location, excessive overburden, or low oil content. Operations are now being carried out on a pilot plant basis to determine whether the process of direct distillation can produce oil successfully from the Alberta sands.

Growth of Aluminium

" Although the Canadian aluminium industry is less than 50 years old and Canada has none of the necessary raw materials, the metal is now sixth in dollar value on Canada's export list," Mr. P. E. Radley, assistant-general manager of the Aluminium Company of Canada, Ltd., told the chemical engineers.

" Aluminium was first produced in Canada in 1900," Mr. Radley said, " and in 1948 the export value of aluminium ingot and products was approximately $100 million. About 14,000 Canadians are employed in the industry by the Aluminium Company of Canada and its affiliates and thousands more are employed by other firms in processing the metal."

Explaining the growth of the industry in Canada, Mr. Radley pointed out that plants were usually started in remote areas where power could be developed in abundant quantities. The power developments usually lead to other industries moving in and creating new industrial centres.

Architecture and building are consuming 35 per cent of all aluminium used in Canada, followed by transportation, 10

(continued on page 398)

Technical Publications

TECHNICAL notes on the work done by the Association of Manufacturers of Bituminous Protective Products are contributed to its bulletin—No. 7 of which has just been issued—by L. G. Gabriel. Subjects reported include "Flow and Gloss"; "Corrosion Tests"; "Adhesion, Flexibility and Bending Tests." Co-operation between the association and the Iron and Steel Institute in connection with tests on exposure behaviour of a range of bituminous compositions, is favourably commented upon.

* * *

SPECIALISED processes in the separation and purification of lubricating and fuel oils are simply explained with diagrams in the latest bulletin (649-2000) issued by Sharples Centrifuges, Ltd., Woodchester, Stroud, Gloucester. There is also a full-page diagram and text describing the working of the Sharples Super-Centrifuge and showing how the separation of liquids and sedimentation of solids is effected.

* * *

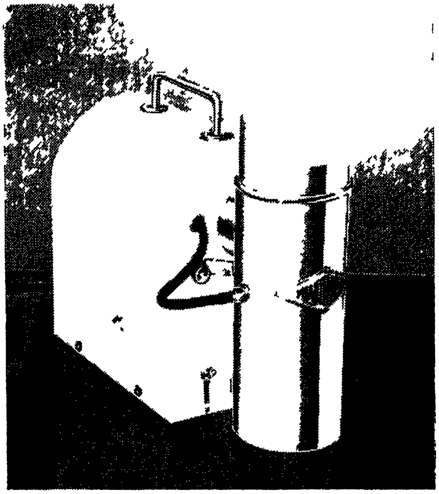
A MINIATURE standard cell which radically departs from the conventional mechanical construction of the Weston standard cell has been designed by Muirhead & Co., Ltd., Beckenham, Kent. This new cell (D-550-A), described in the company's bulletin (B-638-A), consists of a single glass tube, the electrodes lying side-by-side in the base separated by a glass web. The original electro-chemical design is retained, resulting in a unit that is a great deal smaller than that of previous types, has long life and is inexpensive.

* * *

CENTRIFUGAL pumping sets and compressors are described in a new series of leaflets now available from Thomas Ward, Ltd., Sheffield. Other subjects include various types of handling gear such as winches, blocks, hoists, and jacks, and portable belt conveyors of the fixed boom type.

* * *

A NEW paint remover that can be sprayed on to the painted surface and is expected to prove a high-speed method for various industrial processes is described in a 61-page report (No. PB-97659), recently released by the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. ($1.75).



The Phantomyser for pest destruction and air sterilisation was designed by Aerosols, Ltd., London, to produce either a dry aerosol, or, by changing the atomising tank, a fine spray, as required

"HARDNESS Testing," by Reginald S. Bruce, is one of the main articles in the September issue of "Edgar Allen News" (Edgar Allen & Co., Ltd., Sheffield). Special features include an illustrated description of a fabricated unit for use in manufacturing high octane petrol. It consists of high efficiency cyclones, arranged in parallel for collecting fine catalyst dust in the regenerator of a fluid catalytic cracking plant. It is ultimately to be installed at the Abadan refinery of the Anglo-Iranian Oil Co., by the Foster Wheeler Corporation.

N. American Exports Decline

A CONSIDERABLE drop in the value of U.K. chemicals, drugs, dyes and colours exported to Canada and the U.S.A. has occurred during the first seven months of this year (*Board of Trade Journal,* 10 September 1949). The monthly averages are:—

	1st Quarter	2nd Quarter	July
To Canada	£118,000	£132,000	£100,000
To the U.S.A.	£212,000	£115,000	£90,000

Aluminium Trends in North America

Adapting Production to Changing Requirements

BY-PASSING America's largest aluminium producer, the Aluminium Company of America, the Government has approved an aluminium stockpiling programme, requiring the acquisition of some 60 million lb. of metal, which would allow two "small" firms, the Reynolds Metals Corporation, and the Permanente Metals Corporation, to supply all Government needs.

It is contemplated that Alcoa may be eliminated not only from current Government business, but from the Government procurement during the next 25 years. Of the current stockpile requirement, Permanente Metals has been given an option on 40 per cent of the Government's business and Reynolds Metals has an option for the remaining 60 per cent. The former company, which recently contracted to buy three war-surplus aluminium plants, has the option of providing up to about 40 per cent of all "indicated" stockpile purchases for the next 25 years. It is thought that a similar 25-year clause may be granted to Reynolds Metals, which currently is negotiating for four surplus plants it now leases.

Canadian Output

Continuing unsettled world economic conditions are forcing the Aluminium Company of Canada, Ltd., to reduce the rate of operations at Arvida and Shawinigan Falls' smelters. A company spokesman said, that because orders for export shipment were falling off the present high production of aluminium ingot must be adjusted to market conditions. Except in a few years during the war, Canadian production of aluminium has been running at record rates and is stated to have exceeded the most optimistic estimates. After the present reduction of output of 10 to 15 per cent, operations will still be far above pre-war figures.

About 85 per cent of Canadian output is marketed abroad, so that economic conditions in the United Kingdom, Europe, South America and the Far East are a material factor in the flow of orders. Alcan employs about 15,000 workers in its 10 plants in Quebec and Ontario. The curtailment will principally affect the two smelters at Shawinigan Falls and Arvida. The company plans to stock-pile some ingot at various warehouses servicing foreign countries.

Danish Fabricating Plant

The Danish Information Office in New York has announced that the American firm, the Reynolds Metals Company, is now building an aluminium plant in Copenhagen for producing goods for Northern European markets. The plant will be operated in conjunction with the Danish firm, Crown Gummed Paper, and the sales area during the first period of production will be Scandinavia, Holland, and Belgium. Manufacture of aluminium foil, used for packing purposes, is expected to begin this autumn.

MINERAL WEALTH OF CANADA

(*continued from page 326*)

per cent, cooking utensils 14 per cent, electricity uses 20 per cent, and miscellaneous uses 21 per cent.

Hydro-Electric Power in Canada

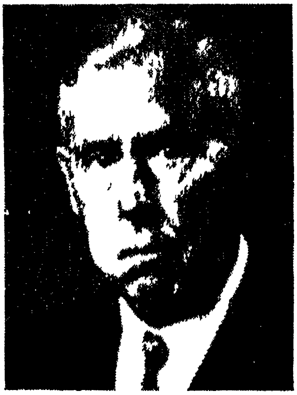
Canadians now employ one horsepower of hydro-electric power per capita, or about five times the proportion in the United States—and the country has a vast potential yet unharnessed, Dr. Huet Massue, engineer-economist of the Shawinigan Water and Power Company told the conference. Within the province of Quebec alone, he said, the hydro installation is about 1⅔ h.p. per person. And the average selling price per kilowatt hour is lower than in any other region of North America, or probably in the world.

The 45 hydro-electric plants in North America have an installation exceeding 150,000 horsepower.

The Canadian production of electricity from all sources is now about 45 billion kWh annually, or double the figure of 20 years ago, and is surpassed only by the United States with its 283 billion kWh. Of Quebec's production of 25 billion kWh last year, about eight billion was consumed by the pulp and paper industry and five billion by the aluminium industry. The millions of horsepower of low-cost electricity awaiting development in central Quebec, he said, assured a dependable supply in the future.

American Science Awards

To receive, next week, two of principal honours of the American Chemical Society, Sir John Simonsen (left) and Dr. G. E. F. Lundell



MANY prominent chemists will receive recognition of their work when various awards of the American Chemical Society are made at its 116th national meeting in Atlantic City, New Jersey, next week.

Among the recipients will be Sir John Simonsen, director of the Colonial Products Research Council of the Colonial Office, who will be the first scientist to receive the Fritzsche Award—for research on essential oils (THE CHEMICAL AGE, *61*, 307).

Dr. G. E. F. Lundell, former chief of the U.S. National Bureau of Standards, Washington, D.C., will receive the $1000 Fischer Award in Analytical Chemistry.

The doctor was cited particularly for his " direct contribution to applied inorganic analysis by devising new, and improving old, methods and for his ability to train young men in the ways of analytical chemistry." During the war, Dr. Lundell's staff developed methods of analysing and purifying graphite and uranium to open the way to the use of these materials in the first atomic pile.

Born in Brooklyn, New York, 68 years ago, he joined the Bureau of Standards in 1918, and increased tenfold the Bureau's supply of standard metal and ore samples. Chemists in many countries now use the samples to check their analytical work, as well as to calibrate instruments and settle market disputes. " Applied Inorganic Analysis," is one of his notable publications.

The Priestley Medal, the highest honour in American chemistry, will go to Dr. Arthur B. Lamb, of Harvard University, for the past 30 years editor of the *Journal of the American Chemical Society*. Dr. Lamb, who is retiring from his editorial post at the end of this year, was cited for his outstanding services in chemistry. During the war he directed the defence chemical research in the Research Division of the Chemical Warfare Service.

The first award of the $1000 Precision Scientific Company Award in Petroleum Chemistry will be made to Dr. Bruce H. Sage, professor of chemical engineering in the California Institute of Technology.

The doctor, whose petroleum research extends over 19 years, is credited with significantly enlarging the recoverable natural oil resources of the United States.

With his associates, Dr. Sage is recognised as having provided background experimental information that has made the so-called cycling technique a routine commercial operation in oil field production. His work has led to increased recovery of oil from underground formations and increased recovery of liquid hydrocarbons from natural gas.

Another award winner is Dr. Richard T. Arnold, of the University of Minnesota, who will receive the $1000 American Chemical Society Award in Pure Chemistry, financed by Alpha Chi Sigma, American national chemical fraternity.

Obituary

MR. E. T. STANNARD, president of Kennecott Copper Corporation, MR. ARTHUR D. STORKE, who was to have succeeded him at the end of the year, and MR. R. J. PARKER, a vice-president of the corporation, were among those killed in a 'plane crash in Canada on September 9. Mr. Stannard was largely responsible for Kennecott's leading financial position, and Mr. Storke, who was born an American citizen but became a naturalised British subject, was recognised as one of the leading figures in world mining industry.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

THE so-called synthetic pyrethrum based on the La Forge synthesis, disclosed last March by the U.S. Department of Agriculture, is now available for experimental work in insecticides, United States Industrial Chemicals, Inc., has announced. The chemical, an allyl homologue of Cinerin I, is practically an exact duplication of one of the active principles of pyrethrum, the natural product, of which the company is a major importer. The new formulation will be available in ample quantities. Entomological and chemical research is being continued and intensified. The chemical is not a synthetic pyrethrum *per se*, but is practically a duplication of only one of the four active ingredients of pyrethrum. Its effectiveness, although equal to that of natural pyrethrins against some insects, shows wide variations in its use in the control of other insects. Pyrethrins derived from African pyrethrum flowers, have had growing usage in the United States as an insecticide. In addition to other applications, they are used in combination with piperonyl butoxide to form United States Industrial Chemicals' Pyrenone.

* * *

The first of an entirely new family of dyes for cellulose acetate fibres, Eastone Red GLF, has been announced by the Tennessee Eastman Corporation. The new dye is said to be exceptionally fast to light even in pastel shades, and to surpass any known acetate red in this respect. Other properties claimed for the new dyes include excellent fastness to gas fading, sublimation, crocking, and hot pressing, as well as very good fastness to perspiration and washing. It is a homogeneous, highly dispersed dye which produces a medium of red with a yellow cast. According to company officials, " it possesses good exhaustion and level-dyeing characteristics with very good penetration and build-up at temperatures of from 160° to 190° F."

* * *

Suits claiming over $2 million damages are expected to be filed against the American Steel and Wire Company in connection with the " smog " that was followed by several deaths in the town of Donora, Pennsylvania, in October last year. Already, the families of ten persons who died have filed suits for $556,000 against the company. The suits, filed in Federal Court, Pittsburgh, Pa., charge the United States Steel Corporation's subsidiary with " willful neglect " in permitting dangerous fumes to hang over the nearby mill town for the five-day period during which 22 persons died and many were injured. Additional suits, totalling $1,487,950, are expected to be filed shortly on behalf of 121 persons who claimed injury to health.

* * *

Milibis, which as Win 1011, was claimed at the last New Orleans (Louisiana) convention of the American Society of Tropical Medicine as a cure for amœbic dysentery, has now been made available to physicians as a prescription speciality, and will be introduced shortly in South America in 0.25 gram tablets. Known chemically as bismuth glycolylarsanilate, the compound has been under clinical investigation in the U.S.A. since 1947. Results published by Dr. D. A. Berberian, whose studies were conducted as a member of the staff of the American University at Beirut, Syria, claim a cure-rate of 90 per cent, based on post-treatment observation of 72 patients for about one year.

* * *

Plant for the annual output of 30,000 long tons of " cold " synthetic rubber has begun production at Houston, Texas, in the Government-owned plant operated by the Goodyear Synthetic Rubber Corporation. Conversion of 24 of the plant's 48 reactors, and installation of refrigeration equipment, was authorised by the federal government less than a year ago. In the past the Houston plant has produced more than 600 million lb. of conventional GR-S. Its remaining 24 reactors will continue production of this material. Dr. R. P. Dinsmore, vice president in charge of research and development for the parent Goodyear company at Akron, Ohio, maintains a conservative attitude as to the new rubber's characteristics when compared with natural rubber. Practically all the work done with " cold " rubber to date, Dr. Dinsmore explained, aimed to develop a standard product. Experience shows that, on small passenger cars, tread wear is increased materially over that of conventional GR-S treads; but cold-weather skidding is increased, and tests on hot-weather cracking are not complete.

· PERSONAL ·

Sir Alfred Egerton, F.R.S., professor of chemical engineering at the Imperial College of Science, and chairman of the British Council's Science Advisory Committee, accompanied by Lady Egerton, left London last week for Helsinki where he is attending the centenary celebrations of the Finnish Institute of Technology. He will receive an honorary degree of the institute and will deliver a lecture on British researches on combustion.

Lady Egerton, who is chairman of the Women's Advisory Council on Solid Fuel and vice chairman of the Housing Centre and of the Women's Gas Council, is to lecture before women's voluntary organisations in Finland and in Sweden, where Sir Alfred Egerton is to meet Swedish scientists.

For his researches in problems concerned with small crystallite size and shape, the crystal texture and imperfections of crystal lattices, Dr. A. J. Guinier has been awarded the 1949 Charles Vernon Boys prize of the Physical Society. It is hoped that the doctor may receive the prize in November, when he is expected to visit England.

The following Australian appointments have been announced in the *Chemical Engineering and Mining Review*: Dr. Ian Clunes Ross to be chairman, and Dr. S. H. Bastow to be a member of the executive of the Commonwealth Scientific and Industrial Research Organisation; Dr. Bastow was formerly chief of the Division of Tribophysics, CSIR. Dr. W. G. Hiscock has been appointed to the board of directors of Sulphide Corporation, Ltd. Mr. B. S. Harrap is a newly appointed research officer in the chemical engineering section, CSIR.

Mr. F. Brundrett, chief of the Royal Naval Scientific Service has been appointed to succeed Sir Edward Appleton as chairman of the Interdepartmental Scientific Panel, set up in 1946 in accordance with recommendations of the White Paper on the Scientific Civil Service.

Dr. Powell has joined the headquarters staff of Evans Medical Supplies, Ltd., Speke, Liverpool 19, and will be in charge of the medical information department.

Sir Alfred Egerton

A new method of detecting and measuring radioactivity, which, it is stated, may intimately affect methods of prospecting for uranium and related substances, is being developed and tested in Northern Canada by Dr. R. W. Pringle, formerly of Edinburgh University and now associate professor of physics at the University of Manitoba, in collaboration with Dr. K. I. Roulston, electronics physicist, and Dr. G. M. Brownhill, head of the geology department of Manitoba University. The instrument used by Dr. Pringle and his colleagues is described as a portable gamma ray spectrometer.

Dr. William F. Hester, former director of insecticide and fungicide research of the Rohm & Haas Company in Philadelphia, U.S.A., has been named administrator of the fellowships of Koppers Company, Inc., at Mellon Institute. Dr. Hester will be responsible for the work of the 98 scientists and their aides at Mellon Institute actively engaged in research and development work on 13 Koppers fellowships.

Lord Leverhulme has been appointed Lord Lieutenant of the city and county of Chester in succession to the late Brigadier-General Sir William Bromley-Davenport.

Sigmund Pumps, Ltd., announces that Mr. Fitzherbert Wright has joined its board of directors.

Lord Melchett, former deputy chairman of I.C.I., Ltd., left £96,968 (gross).

◆ HOME ◆

Liquid Latex Cargo

The first latex liquid rubber cargo to reach Hull arrived on September 9 aboard the British steamer *Penvenue*, which brought 55,000 gal. from Malaya.

Aluminium Replaces Steel

Netting of aluminium alloy, claimed to be as strong as steel but only one-third its weight, has been exported to Australia. Produced in the same meshes and gauges as the normal steel material, it has much resistance to corrosion.

Fire Damage

The upper floors of the Rodmill Chemical Manufacturing Company were ignited during the biggest fire on Merseyside this year, when a large timber store in St. Anne Street, Islington, Liverpool, was totally destroyed on September 9. The flames destroyed the roof; the top floor and the second floor of the building were badly damaged.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in July, include the following (in long tons):—Virgin aluminium: production 2517; imports 24,320. Secondary aluminium: production 5820. Aluminium scrap arisings: total 7238; consumption 8015. Aluminium fabrication: 15,294. Magnesium fabrication: 245.

SCI Fine Chemicals Group

The Fine Chemicals group of the Society of Chemical Industry will hold its opening meeting of the new session on October 11 (7 p.m.) at the Royal Institution, Albemarle Street, London, W.1, when Prof. M. Stacey, University of Birmingham, is to lecture on "Biological Polymerisation, with special reference to Polysaccharide Synthesis." The group, still expanding, now has 355 members.

Captive Balloons for Research

Scientists at the Atomic Energy Research Establishment, Harwell, will be making ascents in a captive balloon in the course of the next few weeks. The purpose is to measure meteorological and other factors to ensure that no harmful effects arise from the operation of the atomic piles and other devices at the establishment Another balloon will shortly be used similarly at the Production Establishment at Windscale, Cumberland.

Paper Pulp Plant for Scotland

Due to arrive in the North of Scotland is a plant from the U.S.A. to permit the operation, by C. Davidson & Son, Ltd., Mugiemoss, of a pulp plant which will utilise thinnings from the Scottish forestry areas.

Refined Oils and Fats

The Ministry of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the 8-week period ending November 5.

Mica Directorate Moves

The Mica Directorate, Board of Trade, removed on Monday from Horseferry House, Thorney Street, London, S.W.1, to Empire House, St. Martins le Grand, London, E.C.1. (Telephone: Clerkenwell 7931.)

New Oil Tanker

An oil tanker, the *Regent Leopard*, launched last week by the Blythswood Shipbuilding Co., Ltd., Scotstoun, Glasgow, has 27 main cargo oil tanks. It is the first of three ordered by the Bowring Steamship Co., Ltd., and is designed to carry a deadweight of 12,300 tons.

Fluctuating Zinc Prices

The Ministry of Supply announces that, resulting from the reduction of the American price from September 10, the price of zinc was reduced by £2 15s. per ton, from £66 5s. to £63 10s. This is the second change within a week.

Zinc oxide prices are correspondingly reduced by £2 6s. 6d. per ton as follows:-Red seal from £65 16s. 6d. to £63 10s.; green seal from £67 6s. 6d. to £65; white seal from £68 6s. 6d. to £66.

Fertiliser Analysis

The Fertiliser Society is to hold a joint meeting with the agriculture group of the Society of Chemical Industry and the Society of Public Analysts, on October 18, at 2.30 p.m., in the chemistry department of the Royal College of Science, South Kensington, London, S.W.7. The subject for discussion is "Fertiliser Analysis, with special reference to Available Phosphoric Acid." Contributors will include: Dr. E. M. Crowther (Rothamsted), Mr. G. Taylor (public analyst), Dr. J. H. Hamence (public analyst), and Mr. W. C. Hanson (Fisons, Ltd.).

◆ OVERSEAS ◆

N.Z. Coal Prospects

Several million tons of high-grade coal have been proved in a seam at Stockton, near Westport, New Zealand.

African Iron and Steel

Southern Rhodesia's four-year plan aims at an output of 170,000 tons of pig iron yearly, sufficient to cover the needs of the Central African territories—Southern and Northern Rhodesia and Nyasaland—during the next six years.

Malayan Tin Shipments

The U.S.A. took practically all exports of tin from Malaya in July. Shipments totalled 5294 tons, and their destinations were: U.S.A. 5000 tons; 149 tons to British possessions; 135 tons to Europe, and 10 tons to other countries.

African Sisal for the U.S.A.

To secure a long-term contract for supplying sisal to the U.S.A. an East African delegation recently sailed for America. It is hoped to conclude an agreement which should earn $10 million a year for the sterling area pool. Mr. A. Hope-Jones, Kenya's Minister for Commerce and Industry, states that this will not mean a reduction in supplies to Britain.

French to Process Indian Monazite

The Indian Government has entered into a 15-year agreement with two French firms, the Banque Marocaine de Credit, and the Société des Produits Chimiques des Terres Rares, to set up a plant for processing monazite sands in India. The plant, which the Indian Government authorities hope will be in operation within a year, is to treat 1500 tons of monazite sands annually and will produce thorium, cerium, and other rare-earth salts.

Norway's Arctic Coal

Spitzbergen can supply at least 1 million tons of coal a year "without difficulty," according to Norwegian mining experts. But increased production, they say, will only be possible when a powerful icebreaker can extend the present shipping season. Spitzbergen seams are rich, and the coal, though small, is of very good quality and has high heating value. Last year, 450,000 tons were shipped from Norwegian mines at Longyear City and Ny Alesund, compared with 300,000 tons in 1938. Plans are being made to increase output to 650,000 tons next year.

£18 Million Refinery Proposal

A scheme for a refinery on the Syrian part of Latakia, estimated to cost £18 million, is proposed by the Anglo-Iranian Oil Company.

Advanced Mechanical Handling

A new bridge transporter, capable of handling 400 tons of coke a day, has been installed at the works of the Metropolitan Gas Company, South Melbourne, Victoria. It stores and reclaims about 145,000 tons of coke a year.

Essential Oils for Argentina

Argentina released news of the development of a new industry for the extraction of mint oil and essences. Imports of these products, formerly imported from the U.S.A. and the United Kingdom, have been prohibited. Acclimatised English mint has been planted extensively in the Province of Mendoza.

Chile Oil Progress

Reports from Chile state that the 32-kilometre pipe-line from Cerro Manantiales oilfield to the coast is well advanced, giving rise to hopes that the refinery which is being constructed at Concon, near Valparaiso, will be in a position by 1952 to provide nearly all home requirements of petroleum, benzine and other by-products.

Australian Fuel Project

The plan to develop the big open-cast coal fields at Blair Athol, may be held up for lack of private capital. Representatives of the Tyre and Traction Finance Company have advised the Queensland Premier that a capital of $80 million would be required to obtain an output of 3½ million tons a year. To raise the necessary capital the company suggests that an association should be established between the Federal Government, the Queensland Government and itself.

Scientific Manpower in Israel

More than 600 scientists engaged in research in natural and applied sciences have been registered with the Scientific Research Council of Israel, which was recently created by the Prime Minister, Mr. David Ben Gurion. The Council has announced that one Israeli will be admitted this year to the annual instruction course for fermentation scientists, sponsored by Joseph Seagram & Sons, of Louisville, Kentucky.

SMOKE ABATEMENT

British and American Collaboration

OVER 400 delegates from local authorities, Government departments and scientific organisations are expected to attend the annual conference of the National Smoke Abatement Society which begins at Harrogate on 28 September.

Dame Vera Laughton Mathews, chairman of the Domestic Fuel Consumers' Council, will succeed Lord Simon of Wythenshawe in the presidency of the society. She is the first woman to hold this position.

Among the many papers for discussion is one by Lord Simon on "Domestic Fuel Policy," and the work of the Fuel Research Station, DSIR, will be described by its director, Dr. A. Parker.

Many Viewpoints

A session to discuss the problem of burning colliery spoilbanks, will be opened by Mr. J. Carr, Chief Scientist of the No. 7 Area, East Midlands Division of the National Coal Board, and Mr. W. A. Damon, Chief Inspector of Alkali, etc., Works. A written contribution to this discussion will be read from Mr. T. C. Wurts, Allegheny County Smoke Control Officer, Pennsylvania—where air pollution has reached dangerous proportions.

Much discussion is expected on a series of progress reports sent in by local authorities and other bodies. Mr. Henry Burns, of the Los Angeles County Smoke Control administration, will give a personal statement at this session on the work of his own organisation.

Science and Glue Manufacture

DR. W. M. AMES, in his paper on "The Manufacture of Hide Glue and Gelatin," presented at the annual conference, at Leeds, of the Society of Leather Trades' Chemists, today (17 September), said that, since scientific methods had been applied to the industry, the quality of glue and gelatin obtainable from poor material had been steadily improved. There remained, however, the problem of finding a less laborious way of turning skin into gelatin and glue. The soaking in lime, when gelatin was the objective, might extend to as long as three months. The proposed formation of the British Glue and Gelatin Research Association showed that the importance of research in this field was appreciated.

NEXT WEEK'S EVENTS

MONDAY, 19 SEPTEMBER

49th Chemists' Exhibition

London: Central Hall, Westminster, S.W.1. Daily, until 23 September.

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1. 5.30 p.m. Opening meeting of the session. Inaugural address by the president, A. W. Wallbank: "Works Organisation in the Metal Finishing Trade."

Institution of Works Managers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2. 6.45 p.m. Annual general meeting. Film: Mechanical Handling."

Glasgow: Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, C.2. 7 p.m. Visit of A. P. Young, chairman of the institution.

TUESDAY, 20 SEPTEMBER

Incorporated Plant Engineers

Glasgow: Engineering Centre, Sauchiehall Street, 7 p.m. "The Inside Story," by Mr. McHutchinson (The Vacuum Oil Co.).

WEDNESDAY, 21 SEPTEMBER

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. "Atomic Physics."

Bristol: Grand Hotel, 7.15 p.m. W. D. Austin: "Administration and the Works Engineer."

THURSDAY, 22 SEPTEMBER

Incorporated Plant Engineers

Sheffield: Grand Hotel, 7.30 p.m. South Yorkshire Branch. Joint Meeting with the Institution of Works Managers.

British Iron and Steel Research Association

Leamington Spa: Ashorne Hill. Conference on Foundry Steel Melting: Session 1, "Cupola/Converter Process"; Session 2, "Electric Arc Process."

Society of Public Analysts and Other Analytical Chemists

Nottingham: Technical College. Meeting of the Microchemistry Group.

FRIDAY, 23 SEPTEMBER

British Iron and Steel Research Association

Leamington Spa: Ashorne Hill. Conference on Foundry Steel Melting: Session 3, "Other Melting Processes"; Session 4, General items.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

British Aluminium Co., Ltd., London, E.C. (M., 17/9/49.) August 10, disposition by Robt. Lyle with consent of the company in implement of a trust deed dated July 30 1947, and supplemental deed registered November 10 1948; charged on Lindean, 16 Learmonth Street, Falkirk, with fittings, etc. *£5,000,000. May 4 1949.

Electronic Products (Glos.), Ltd., London, S.W. (M., 17/9/49.) August 8, £3000 debenture (to rank *pari passu* with debenture dated June 3 1949), to J. Cooper, Cropton, Pickering; general charge also £3000 debenture (to rank as second charge after first debenture dated June 3 1949, and first debenture dated July 28 1949), to J. J. Denny, London; general charge. *£4020. April 30 1948.

Hinckleys Silica Sands, Ltd., Sheffield. (M., 17/9/49.) August 10, mortgage, to Sheffield Buiding Society securing £1325 and any other moneys, etc; charged on 60 Newpool Road, Knypersley. *Nil. July 27 1949.

Kent Chemical Co., Ltd., Tenterden. (M., 17/9/49.) August 10, debenture, to Turnerstyle, Ltd., securing all moneys which may at any time and from time to time be owing by the company to the holders; general charge. *Nil. July 10 1948.

Pestcure, Ltd., London, W. (M., 17/9/49.) August 5, £3950 debenture, to G. H. Evans, London; general charge.

Solartron Laboratory Instruments, Ltd., Kingston-on-Thames. (M., 17/9/49.) August 12, £50 debentures, part of a series already registered.

W. K. Supplies, Ltd., Croydon, nickel platers, etc. (M., 17/9/49.) August 2, £1500 debenture, to C. Collin, South Croydon; general charge. *£750. December 17 1948.

United Carbon Black, Ltd., London, S.W. (M., 17/9/49.) August 11, first debenture and a charge created by the company (jointly with United Kingdom Chemicals, Ltd.) securing to Westminster Bank. Ltd., all moneys due or to become due to the bank; respectively a general charge and charged on the company's equal half share in leasehold property at Llansamlet (Glam.) held jointly with United Kingdom Chemicals, Ltd.

Satisfactions

Electronic Products (Glos.), Ltd., London, S.W. (M.S., 17/9/49.) Satisfaction, August 8, of debenture securing all moneys, etc., registered April 8 1947; also satisfaction August 8 of debenture registered June 13 1949, to the extent of £3000.

Warrington Red Moulding Sand Co., Ltd. (M.S., 17/9/49.) Satisfaction, August 15, £1000, registered January 9 1937.

New Registrations

Acrylite (Blackpool), Ltd.

Private company. (472,610). Capital £2000. Manufacturers of plastics and plastic substances, moulding materials, and chemical and other substances, etc. Directors: D. C. Walsh, P. Morris and F. L. Morris. Reg. office: Victoria Chambers, Victoria Square, Cleveleys, Lancs.

Seaweed Products, Ltd.

Private company. (472,681). Capital £1000. Objects: To acquire Patent No. 590991 dated May 23 1947, owned by J. Toba; and to carry on the business of manufacturers of seaweed and seaweed products, including fertilisers, feed for livestock and fish machines, etc. Director: J. Toba. Reg. office: 39 Woodberry Down, Manor House, N.4.

Welspred, Ltd.

Private company. (472,685). Capital £1000. Manufacturers of fertilisers, manures, manufacturing chemists, spreaders of fertilisers and manures, etc. Reg. office: 48 Meadow Road, Kettering.

The following increases in capital have been announced: Llewellyn Ryland, Ltd., from £50,000 to £60,000. Muntona, Ltd., from £75,000 to £215,000. Petro-fuel Products (Porth), Ltd., from £5000 to £9000.

The Stock and Chemical Markets

SATISFACTION with the outcome of the Washington financial talks helped sentiment in stock markets, where British Funds have rallied in response to the news that sterling is not to be devalued. Leading industrials were helped by the rally in British Funds, but the main emphasis was again on shares of companies which are potentially or actually dollar earners.

Imperial Chemical further strengthened to 44s. 3d., Monsanto were firm at 50s. 6d., Fisons remained around 37s. 3d. to which they declined following news of the big new issue. Brotherton 10s. shares were 19s. 6d. Elsewhere, Albright & Wilsons 5s. shares have been steady, awaiting the interim dividend. Amber Chemical 2s. shares were 5s., F. W. Berk 2s. 6d. ordinary 12s. 6d., Boake Roberts 28s. 9d., and Bowman Chemical 4s. shares 6s. 9d. Calor Gas 5s. shares have now risen to 18s., Pest Control 5s. shares were 8s. 3d., and, among preference shares, L. B. Holliday 4½ per cents were 20s. 6d., W. J. Bush 5 per cents 23s. 6d., and British Chemical & Biologicals 4 per cents 19s.

Turner & Newall rose to 78s., the units of the Distillers Co. were 27s. 4½d., and United Molasses were active around 39s. 3d. Glaxo Laboratories strengthened further to £19¾ on market talk that share bonus proposals may be announced when results for the financial year are issued. Tunnel Cement have risen to 45s. 9d., affected by the company's resistance to nationalisation, and Associated Cement at 75s. 7½d. were also higher. Lever & Unilever were firmer at 42s. 6d., and Dunlop Rubber were active at 64s., while Borax Consolidated remained active on the company's important assets and trade in the U.S. and have risen further to 58s. 6d. at the time of writing. British Oxygen were firm at 93s. 3d. Triplex Glass rose to 20s. 3d. The company has scope for expanding export trade and demand for safety glass for vehicles and aircraft should increase. Amalgamated Metal have been firm at 18s. 3d., and Metal Box shares at 96s. 3d. strengthened on talk of share bonus possibilities. General Refractories changed hands around 22s. 10½d., and British Plaster Board 14s. 1½d.

British Xylonite at 78s. were improved; Erinoid 5s. shares were 6s. 3d., and British Industrial Plastics 2s. shares 5s. De La Rue receded to 24s. 4½d., and Coalite & Chemical 2s. shares have changed hands around 2s. 4½d. British Aluminium were steady at 13s., as were British Glues 4s. shares at 19s.

Iron and steels were helped by the latest production figures, and shares on the nationalisation list further improved because of the good yields, expectations that dividends will be maintained, and the lessened prospect of nationalisation.

Market Reports

UNCHANGED conditions summarise the position on the general chemicals market and prices throughout remain steady with a distinctly firm undertone. Buying, both for home and export account, has been on a satisfactory level and traders report rather more inquiry from home consumers for contract business. The call for the general run of soda products is satisfactory, with bichromate of soda and yellow prussiate of soda receiving a fair attention, and there has been no curtailment in the demand for the potash compounds. A good business is reported in British-made formaldehyde and there has been a steady inquiry for barium chloride. Interest in the non-ferrous metal compounds remains active and no further price alterations have been reported. The coal tar products market is without feature and supplies of most products are more than sufficient to take care of current requirements. Pitch continues to be in good request both on home and export account.

MANCHESTER.—Trade in the general run of both light and heavy chemical products on the Manchester market during the past week has been steady, and the seasonal restrictive influence seems now virtually to have disappeared. Deliveries of chemicals to the textile and allied industries, as well as to the rubber, paint and paper-making sections, have been on a good scale, and most other leading industrial users are taking satisfactory supplies. A fair mount of new buying interest has been in evidence. Trade in the by-products has been rather patchy, with the light distillates attracting most attention. A quiet but steady trade has been reported in superphosphates and some other fertilisers.

GLASGOW.—There is nothing of special interest to report for the Scottish chemical market this week. Prices, in general, remain steady, although there is a tendency for slight increases in the heavy chemicals.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Methods of making organo siloxanes.—Dow Corning Corporation. Feb. 26 1942. 628,072.

Nitrogen containing derivatives of 3-pentadecyl phenol.—Harvel Corporation. July 31 1946. 627,918.

Phenolphenolether condensation products.—Harvel Corporation. Oct. 10 1942. 627,919.

Sulphonated phenolic condensation products.—Harvel Corporation. Nov. 2 1944. 627,920.

Solution of a rotenone-containing phenol-aldehyde insecticide.—Harvel Corporation. May 3 1939. 627,925.

Insecticidal solution of rotenone in a phenol-formaldehyde-type resin.—Harvel Corporation. May 17 1941. 627,926.

Nitrogen containing derivatives of tetrahydrocardanol. — Harvel Corporation. March 31 1945. 627,927.

Nitrogen containing derivatives of tetrahydrocardanol.—Harvel Corporation. Aug. 21 1946. 627,928.

Stabilisation of asym-dichloroethylene. —I.C.I., Ltd., and F. W. Kirkbride. Aug. 11 1947. 627,930.

Devices for atomising liquids.—E. G. Cribb. Aug. 25 1947. 628,083.

Sintered friction material.—A. F. Burgess. (S. K. Wellman Co.). Dec. 10 1945. 628,110.

Production of melamine.—E. I. Du Pont de Nemours & Co. Dec. 28 1944. 628,250.

Processes for preparing crystalline penicillin in the form of its ammonium salt.—Commercial Solvents Corporation. Jan 31 1945. 628,251.

Process for the production of melamine. —E. I. Du Pont de Nemours & Co. Feb. 28 1945. 628,255.

Processes for producing products containing copper oxychloride.—Sirco A.G. April 19, 1945. 628,114.

Manufacture of intermediates in the synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14 1945. 628,258, 628,259.

Manufacture of alkali bicarbonates or carbonates.—H. W. Lehrecke. Nov. 10 1945. 628,119.

Beta-dithiocarbamyl carboxylic compounds and method of preparing same.—B. F. Goodrich Co. Oct. 5 1945. 628,397.

Nuclear chlorination of aromatic carboxylic acids.—B. F. Goodrich Co. Nov. 11 1944. 628,401.

Metallic powders and treatment thereof. —S. K. Wellman Co. May 3 1946. 628,183.

Purification of naphthalene.—Midland Tar Distillers, Ltd., R. Scott, and E. H. Joscelyne. Dec. 5, 1946. 628,403.

β-Amino-propionitriles and method of producing same.—American Cyanamid Co. Jan. 8 1946. 628,141.

Production of anhydrous zirconium tetrachloride and the production of zirconium therefrom.—J. W. Kroll. Feb. 17 1945. 628,147.

Polymerisable materials and polymers thereof.—I.C.I., Ltd., and R. Hammond. Feb. 10 1947. 628,150.

Catalysts.—I.C.I., Ltd., and P. W. Reynolds. Feb. 14 1947. 628,405.

Means for use in the dissemination or diffusion of disinfectants, insecticides and like preparations.—International Toxin Products, Ltd., and A. C. Hudson. Feb. 24 1947. 628,151.

Catalysts.—I.C.I., Ltd., and P. W. Reynolds. Feb. 26 1947. 628,407.

Process for the manufacture of isoalloxazines.—F. Hoffmann-La Roche & Co., A.G. April 4 1946. 628,410.

Production of ureido derivatives.—Geigy Co., Ltd., H. Jones, and J. K. Aiken. April 10 1947. 628,291.

Synthesis of esters.—E. I. Du Pont de Nemours & Co., and R. E. Brooks. April 17 1947. 628,160.

Manufacture of acetic acid.—W. H. Groombridge. April 21 1947. 628,161.

Ethylene cyanohydrin and method of producing same.—American Cyanamid Co. May 4 1946. 628,413.

Process of preparing $CClF_3$.—E. I. Du Pont de Nemours & Co. Aug. 7 1946. 628,165.

Production of hydrogen.—Standard Oil Development Co. Oct. 9 1946. 628,417.

Process for the manufacture of folic acid. —Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). June 13 1947. 628,305.

Manufacture of catalysts.—Standard Oil Development Co. Oct. 16 1946. 628,420.

Compositions comprising synthetic rubber and anacardic materials.—Harvel Corporation. June 27 1944. 628,358.

After all, manufacturers of foodstuffs, pharmaceuticals, beverages and cosmetics, to mention only a few products, don't *have* to put up with unwanted odours, unpleasant flavours, lack of colour or too much of it. Active Carbon copes with all of these problems and also traps impurities which can't be detected by eye, nose or tongue. It also simplifies crystallisation and cleans precious fluids and gases. Why not get in touch with the Active Carbon specialists and find out all about it?

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SOURCE OF NEW FATTY ACIDS

Advanced American Processes in Lancashire

HESS PRODUCTS, LTD., of Leeds, has described in a Press statement some of the potentialities of the new fractional distillation plant for the separation of fatty acids which it is erecting in Lancashire and which will duplicate the advanced methods being employed by Armour & Company in Chicago. The plant, which is the subject of a licence agreement with the Chicago company should be operating in January and Hess Products claims that it will be the first of its kind outside the U.S.A. and will make available a new range of fatty acids.

Fractionating Towers

The process, says the Leeds company, is a logical development in the field of fat distillation and was brought to its present efficiency by years of engineering and technical research, by Armour & Company. In essence the technique is very similar to that of petroleum fractionation and takes place in fractionating towers constructed of stainless steel which give off four fractions containing:—

(1) An overhead fraction including odour and unsaponifiable matter.
(2) Acids of medium boiling point.
(3) Acids of high boiling point.
(4) A residue.

The plant is heated by Dowtherm and is controlled by an elaborate system of instrumentation. High vacuum and close control of the heating ensure that the products are not decomposed at the high temperatures involved. Foster Wheeler, Ltd., of London, the British branch of the American firm of petroleum engineers, is erecting the plant.

Until now, observes Hess Products, the only methods of separating mixed acids have been by use of a solvent and liquid fraction. The Armour fractional distillation process enables the component acids of different carbon chain length to be separated from any mixture of fatty acids. The process will produce fatty acids ranging from C-8 to C-22 of up to 90 per cent purity if so desired.

Materials produced at present by Armour & Company include: Lauric acid (lauric 90 per cent, capric trace, myristic 9, unsaturated acids 1); Palmitic acid (palmitic 90 per cent, oleic 4, stearic 6); Stearic acid (stearic 75 per cent, palmitic 22, oleic 3); Pure stearic acid (stearic 90 per cent,, palmitic 6, oleic 4).

The unsaturated acid products will in some cases be mixed, since the process does not separate acids of the same carbon chain length. A typical mixed product is mixed C-18 acid, which is composed of linoleic acid 50 per cent, oleic acid 40 per cent, saturated acids 10 per cent, with a titer of 23° C. and an iodine value (Wijs) of 120.

Wide Application

The company says that the new grades of fatty acids will be competitive with existing ordinary grades. The saturated acids will be of interest to the manufacturers of chemicals, rubber, grease, and cosmetics, and will be valuable starting materials for fatty acid derivatives such as esters, amines, nitriles, and metallic salts.

The unsaturated materials are suitable for use in protective coatings in the paint and varnish fields and for plastics.

Construction has started at Littleborough and the main 65 ft. fractionating column was recently hoisted into position.

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Devaluation

SIR STAFFORD CRIPPS was less than fair when in his broadcast he said that "normally before the two wars—and at times between them—you could change our one pound sterling into other kinds of money . . . . Soon after the end of the last war we came back to this very useful arrangement." The money of 1914 was all gold, while that of 1945 was nothing better than an alloy of politics and paper. For the Chancellor to suggest any similarity between the pre-1914 free market position and that of to-day is, to put it mildly, unworthy of him.

What has happened is simply this. We have abandoned the fiction of 4.03 and put in its place another equally fictitious figure, 2.80, which leaves the money of the world in every respect as unreliable as before. The stability of the gold standard, to which Sir Stafford has surely no right to refer, relied upon the confidence of a perfectly free market in which chancellors everywhere took no part whatever. The stability to which Sir Stafford pins his faith at a fixed empirical rate is only stable so long as chancellors and politicians remain of the same mind and until on some future Sunday night another figure is announced.

Even without gold no trader was unable to know how much he could get in his own money if he sold goods abroad and how much he would have to pay in their own money for the goods he imported from other countries. Traders everywhere did, in fact—to quote Sir Stafford Cripps—"know where they were in their business." The bankers were able at any moment to cover commitments in any direction at the rates of exchange upon which those commitments were founded. The bankers' machinery is entitled to far more credit than has yet been recognised for the facilities which were so readily provided and available to all.

It may be that in confounding all the pundits, and going lower than the worst of the pessimists had prophesied, Sir Stafford has it in his mind to free the pound. Unlike commodities—sweets and clothes—the ideal to be aimed at is that the pound should be dear. If, therefore, a little later on freedom were announced, the chances of a rise from 2.80 are obviously better than from a higher figure of 4.03. The immediate risk is of unforeseen changes in unexpected quarters.

If the British Treasury thinks it wise to start the fashion in currency manipulation, a hundred other monetary authorities may see chances of their own and we may expect from

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

day to day to hear that Israel, Egypt, Ceylon or the Argentine has taken some step which will throw the market out of gear. Sir Stafford himself referred to this danger and confessed that the effect upon our cost of living would depend upon what other countries did.

The immediate aim is to earn more dollars. Up to Saturday last, £1 of export produced 4.03 dollars. From Monday morning the same export only produced 2.80 dollars. From which it follows that if we earn the same amount of dollars we must increase our production by one-third more than at present, and if we hope for more dollars the increase in production must be higher still.

There will be wide differences of opinion as to how far this can be done. If Sir Stafford is to be believed, and if the country is really doing its best and the workers working to the full, then it is a little difficult to see from where the very big increase in production now required is to come. The differences of opinion will depend upon the different views as to how far full employment means full work and what is the effect of enforced social service upon individual endeavour.

Manufacturers and traders should be quick to protest against Sir Stafford's suggestion that there "should not be any noticeable increase in their retail prices" and that he will "not tolerate anyone taking advantage of the situation." These remarks, coupled with the suggestion that 1½d. on the price of the loaf is all that should happen at home, cannot be reconciled with the official statement that the dollar content of the Cost of Living Index Figure is 16 per cent. There are indeed very few of our manufactures which do not contain some item of dollar cost, and if the official 16 per cent is reliable the result must be an all-round increase in price.

How much better if the Chancellor had summoned up the courage to free the pound, and announced the end of control of our money. Such a step could have been taken without regard to any of the other numerous controls existing. It would have involved a period of confusion at the start, but not nearly so much confusion as we may expect in the next few weeks and months. The result of allowing the pound to find its own value through

(continued on page 414)

Notes and Comments

University Libraries

A PLEA that the university librarian should have expert assistance in book selection, as his library was becoming increasingly important and was a specialist one in the many subjects taught and studied, was made by Dr. W. Bonser, Birmingham University librarian, at the Summer School of Librarianship, in Birmingham last week. He said the library of which he was custodian received regularly more than 2000 periodicals, and this number was all the time being added to as the range of subjects taught widened. Text books in science, technology, medicine and law went out of date more quickly than did those on the humanities and should, therefore, regularly be "weeded" and replaced by the latest editions. The librarian and his staff must keep in the closest contact, not only with the everyday work of the students, but especially with the teaching staff which directed the studies. The library was an integral part of the working of the university and was an important adjunct to every department.

Significance of Wilton

THERE are many more aspects of Wilton than those touched on in the speech of Lord McGowan. While there was little evidence of new principles being applied, the extent of application of known advanced practices was quite noteworthy. Thus, automatic push-button control has been carried to an extraordinary extent and scope. At the touch of a button in the P-F moulding powder house, one operator can convey wood-flour from any bunker at a chosen rate along a desired route to a particular mixer, and follow the path of the powder by means of coloured lights. In the same plant, but on the resin side, one operator controls the raw material storage tanks (fitted with continuous recycling and thermostatic devices), automatic scales, mixers and reaction vessels. All this is in a plant with an output of about 25 tons of finished moulding powder per day. Any failure of devices or increase in temperature in reaction calls into play automatic alarms and corrective measures. More effective than the most impassioned exhortations and importunings, this is without doubt the way to that higher productivity and p.m.h. which is so much to be desired. The "Link" connecting Wilton and Billingham by under-river tunnel is also symbolic. Movement by truck within the works and between works has been cut to a minimum; wherever possible, liquid is piped and solids moved by conveyor, ensuring the smoothest flow of product at the smallest consumption of manpower.

Ninety Years' Growth

LAST month the modern oil industry celebrated its 90th birthday. Drake's "folly" of drilling a hole into the earth has proved to be an enterprise which has brought incalculable wealth to the world. The truth of this is recalled by the Petroleum Information Bureau in an historical study of oil, showing how eventful has been the development of the commercial exploitation since those pioneering days. It may not be an overstatement to say that oil, upon which so much of industry and domestic wellbeing depends, to-day has surpassed coal in importance. Meanwhile, the chemical uses of oil are virtually certain to multiply, affording new products and making fresh demands. Experts consider there is enough crude oil in the earth to meet this and all the other demands for centuries to come; and even if the natural supply of crude fell short, a sufficient quantity of liquid fuels could be made. It has been calculated that, when Marshall Aid ends, in 1952, Western Europe's average daily consumption will have increased by 50 per cent. The new factor in equating supply and demand is the entry of the United Kingdom as a future large supplier of refined oils and derivatives. Shell at Stanlow, and Anglo-American at Fawley, are making great additions to the cracking and refining plants, and last week's formal opening at Wilton of the I.C.I.'s group of new factories has an intimate bearing on the same policy. Such industries are not developed without enormous expense for plant and research. In America, the Standard Oil Company (N.J.) devotes the equivalent of £5 million annually for research, and I.C.I.'s own allocation bears comparison with that. The Standard Company has computed that the average return in the long run on every dollar spent on research is $15. This may or may not come to be known as the Petroleum Age, but the portents for the chemist are clear. "I am one of those"—wrote Sir Robert Robinson recently—"who have been convinced by the evidence that the future prosperity of the chemical industry cannot be assured unless we strive with all our might to take our full share in the manufacture of chemicals from petroleum."

DEVALUATION

(continued from page 412)

the higgling of the market, and to stand out as the one currency in the world backed by the considered views of willing buyers and willing sellers, might well be to put up the pound even higher than 4.03 instead of to depress it.

The world has not yet forgotten its one-time dependence upon sterling. It is afflicted with political money in which a minimum of confidence can be placed, and there is more than a possibility that traders of other countries would show a marked preference for the one recognised currency which had behind it, not the power of any state or the views of any politician, but the real value which only a free market can give.

Interchange of Knowledge

THE importance of the interchange of men and women between countries as a means of spreading not only better understanding between nations but for the dissemination of knowledge and technical information is becoming increasingly appreciated. Robert Oppenheimer, the American scientist, once remarked that "Perhaps the best way to send knowledge is to wrap it up in a person," and the truth of this maxim was freshly brought to mind last week by the arrival in this country of 15 professors and 60 post-graduate students who will spend a year here doing research work or on university courses. These visitors come under a scheme evolved by Senator Fulbright, the Rhodes Scholar, funds being provided from the sale of surplus war equipment. Particulars of various schemes of exchange and the large numbers of American bodies and voluntary organisations active in promoting them are given in a booklet "Building Roads to Peace," recently issued by the State Department in Washington. The American Chemical Society figures prominently in the list with offers of UNESCO Fellowships for study in chemistry and chemical engineering. Recipients have to give the assurance that on expiration of fellowship they will return to their own country to resume specified employment for not less than two years, and that it will contribute to their country's scientific and cultural reconstruction. The booklet is meant primarily for reading in the U.S.A., but it is worthy of attention in Great Britain for the exchange of persons should, to be of real benefit, most surely be wholly internally. There is, of course, also a scheme inaugurated by the Canadian-British Education Committee, under which the last party of a number of British students left Liverpool this week to spend next session at McGill University, Montreal. Such interchanges deserve the fullest support of both official and voluntary helpers in the nations concerned.

GERMAN PATENT OFFICE

Big Task for Munich Staff

ANGLO-AMERICAN authorities recently gave their agreement to new German patent legislation and it is expected that the new Federal Patent Office will be officially inaugurated on October 1.

The new Patent Office has been allocated premises in a wing of the German Museum, Munich, and it will function in the three Western zones as a successor to the old *Reichspatentamt* in Berlin.

Dr. Eduard Reimer, a Berlin lawyer who has specialised in patent and trade mark law, has been elected president. He will be assisted by a staff of some 750, compared with 1600 persons formerly employed in Berlin.

It is reported that some 250,000 volumes out of the original 400,000 books in the original library have been secured for the Munich office. They are said to have been saved from a salt mine where they were concealed during the war.

No less than 60,000 applications for patents and 50,000 for trade marks have been received at offices established about a year ago in Darmstad and in West-Berlin, and these will now have to be dealt with by the new patent office.

Uncertainties which have so far existed in Germany regarding patents and trade marks should now be ended. Rights formerly dealt with by the Berlin office can now be attended to in Munich, provided that application to this end is made before June 30, 1950.

All patents and trade marks registered in Berlin before January 1, 1932, lose their validity in the Western occupation zones.

Upon instructions of the Anglo-American authorities, the new patent office will not, for the time being, carry out examinations of patents because it is anticipated that new and internationally valid regulations for this purpose will soon be promulgated.

Tests will be carried out periodically by the Allied occupation authorities to ensure that prohibitions imposed in the field of research are being maintained.

Atomic Energy Talks

British, American, and Canadian scientists are to meet at Chalk River, Canada, on September 26 to discuss the working of combined arrangements for release of scientific and technical information on atomic energy.

CHROME PIGMENT EXPORTS

Exemption from Licensing

THE withdrawal of chrome pigments from the list of goods requiring export licences has been agreed by the Board of Trade. The decision was given effect by a Statutory Instrument which came into operation on Monday this week.

The result recalls that for 17 months pressure has been exerted by the British Colour Makers' Association.

Relevant extracts of interest have been given in a Press notice (No. 985) issued by the Board of Trade on September 14. In Group 13(1) the item relating to chromium compounds has been deleted and the following substituted:

"Chromium compounds and preparations thereof (other than lead chrome and zinc pigments), but not including lacquers, paints, paste paints and painters' enamels unless specified elsewhere in this group."

The BCMA observes that the order thus exempts lead chrome and zinc chrome pigments and it follows that mixtures of these pigments with Prussian Blue or with many extenders will no longer be subject to control.

It is noted, however, that blanc fixe remains subject to licensing, as do dyestuffs generally, so that chrome pigments mixed with these products will continue subject to the licensing procedure.

Exporters are reminded that, to avoid delays in Customs clearance, consignments should always be made under the descriptions specifically exempted from licensing, i.e., as "lead chrome pigments" or "zinc chrome pigments" and not under other technical names.

Suspension of Metal Sales

SALES of copper, lead zinc, tin and aluminium by the Ministry of Supply were temporarily suspended from midnight on September 17. Announcing this on September 19, the Ministry stated that orders posted on or before September 17 would be accepted at the prices ruling on that day provided normal conditions had been complied with.

Orders posted after that day would be dealt with at the new prices when trading was resumed.

Sales were announced to be resumed on Thursday, September 22, at new prices to be announced by the Ministry.

Advanced Equipment at Wilton

I.C.I.'s Bid to Eliminate Smoke and Pollution

THE heightened recognition by chemical industries of their responsibility to maintain new high standards of public amenity, in addition to making full use of present advanced technology, was well illustrated during last week's tour by invitation of I.C.I., Ltd., of its 2000-acre site of the new chemical centre near Middlesbrough.

The social value of the Wilton enterprise owes much to the fact that it will eventually give employment to 15,000 belonging to a Tees-side area which, in the current uncertainty of stable trading conditions, might well have known again the bitter experience incidental to being a "depressed" area. Equally important, Wilton is planned to offer employment under conditions which appear to mark an advance on the comparatively high standards of welfare lately attained in large-scale chemical production.

An important factor to promote the same result is the widespread use of cyclone extractors and electrostatic precipitators; these also help to ensure that the locality will not suffer from the polluted atmosphere once characteristic of the "chemical towns" of the north.

Of the 250,000 tons of oil to be cracked annually, half of the products will be in terms of petrol. The actual cracking plant is American (by Kellogg), although much of the ancillaries of the plant and some of the equipment were made by I.C.I.

Production of Perspex, already started at Wilton, is expected to reach a yield of ten tons a day in sheet form.

The section of the plant making P-F (phenol-formaldehyde) moulding powder is also in production, and is expected to be very much more active in a few weeks' time. At the start, something like 20-25 tons a day of this moulding powder is being produced.

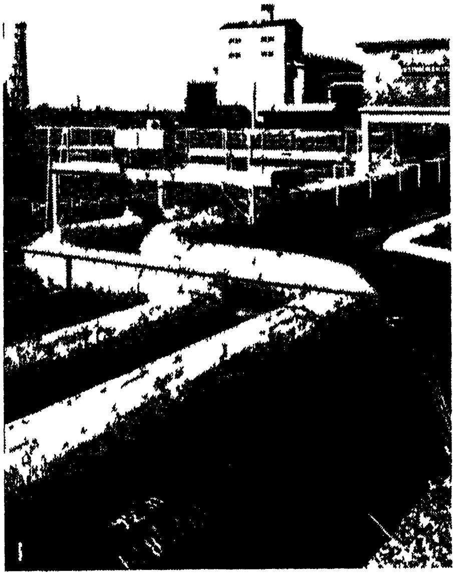
The construction of a section for the production of urea-formaldehyde is now due to commence.

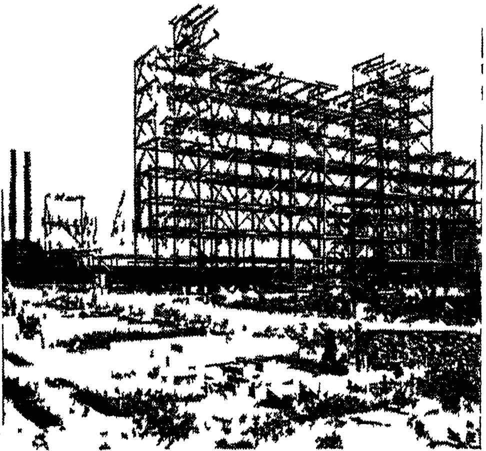
At Teesport, the oil storage end of the Wilton works, begins the under-water section of the pipeline to the Billingham works. The tunnel is 100 ft. below ground level. The gas and oil transported through it are in welded pipes, and special precautions have been taken to exclude the possibility of escape of either.

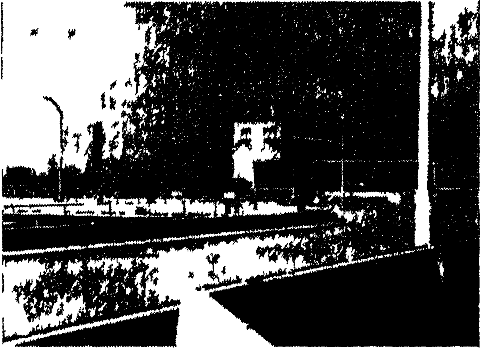
Left to right: Dr. J. W. Armit, Lord McGowan, Mr. J. Rogers.

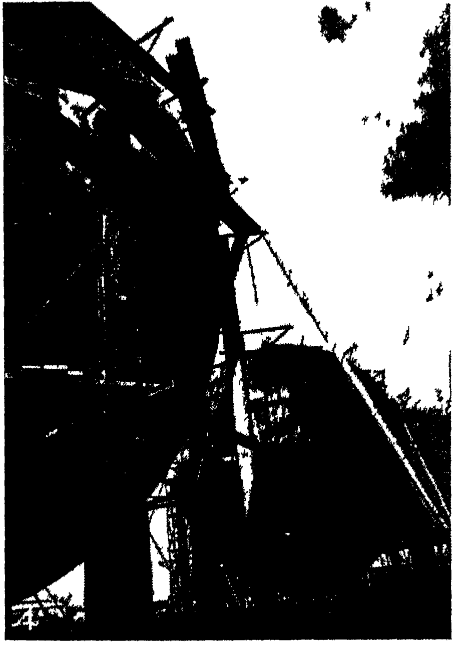
On facing page: 1. Oil-fired boilers and steam distribution pipes. 2. Oil cracking plant, steelwork and buildings. 3. Oil-fired boiler plant. 4. Hortonspheres for storing ethylene. 5. Phenolic moulding powder plant.

In the New I.C.I. Wilton Works









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A Recent Formaldehyde Process

Italian Hydrogen Recovery Method

THIS new method of producing formaldehyde with recovery of hydrogen, which formed the subject of his paper read at the 21st congress of industrial chemistry in Brussels, held September 12/19, 1948, is described by Mario Maccaredda (*La Chim. et l'Ind.*, 1949, *31* (3), 7780). The method of producing the formaldehyde from methyl alcohol by oxidation and dehydrogenation may, he says, be modified in such way that the hydrogen formed may be recovered and used again directly for the synthesis of the alcohol.

Alcohol Tests

Tests of simple dehydrogenation of alcohol by passage through a copper tube heated by the Joule effect from an electric circuit, preferably in the presence of water vapour to avoid poisoning of the catalyst, have provided a method for such recovery of hydrogen mixed with a certain amount of CO. Further tests have shown, however, that by using oxygen with various catalysts such as copper, silvered copper, platinised copper or silver, the process is much more effective.

Using copper electrolytically silvered in a bath of silver acetate, yields have been increased up to about 85 per cent, with recovery of hydrogen to the extent of 0.3 to 0.4 cu. m. per kg. of methyl alcohol used, and oxygen consumption of 0.4 to 0.7 cu. m. Using platinised silver as catalyst, the conversion yield is somewhat less, but so also is the oxygen used, being about equal to the hydrogen recovered.

Hydrogen as Diluent

It has also been shown that oxidising and dehydrogenating in the presence of hydrogen as diluent give yields corresponding to those obtained from the normal air process but with additional formation of 0.13-0.16 cu. m. of hydrogen—according to conditions—of methyl alcohol converted, with a consumption of oxygen 1-3 times the volume of hydrogen recovered.

The author reviews the two main groups of processes for production of formaldehyde from methyl alcohol, including those of the U.S.A. and of Germany (I.G. Farben). His own work in this field was begun in 1938 and resumed again, after some years' interruption, in 1946. It appears to have successfully passed the pilot plant stage.

Details are given with tabulated data of simple dehydrogenation of methyl alcohol and of dehydrogenation and oxidation with and without hydrogen, using as catalyst principally the silvered copper in the form of gauze.

The tabulated results confirm the possibility of producing formaldehyde with very much the same apparatus and with the same yield as is normally obtained. Air is replaced by a mixture of oxygen and residual gas containing hydrogen, and by increasing the rate or volume of gases in circulation there is very good recovery of hydrogen

Since the cost of the oxygen used is less than half that of the hydrogen recovered, the method offers economic advantages. Working with a large scale plant, the balance of advantage should be even greater than that indicated by laboratory tests. (*Centro Studi di Chimica Industriale del C.N.R.*, Ist. di Chim. Ind. del politec. di Milano, Jan., 1949.)

Allied Trademark Rights in Japan

THE Far Eastern Commission approved at a recent meeting a decision to provide for the restoration of Allied-owned trademark rights which were lost as a result of the war and for the protection of Allied trademark rights in Japan and elsewhere against infringement by the Japanese.

At the outbreak of hostilities between Japan and the Allied countries all trademark rights belonging to Allied nationals were seized under Japanese war-time laws. Under the policy recently adopted, the registrations of such rights are to be extended from the date of restoration for a period equivalent to the unexpired period at the time they were lost.

Before the war, the Japanese copying of foreign designs and mismarking of goods presented a serious problem. Various methods were adopted to induce foreign buyers to purchase Japanese articles.

The new policy requires the Japanese Government to prevent further registration of trademarks which are confusingly similar to well-known foreign marks, and it permits U.N. nationals to apply for cancellation of any such marks already registered.

EXTINCTION OF PETROLEUM FIRES

The Application of Air Foam and CO_2

SOME further work on the study of fires in tanks containing petroleum products, and the extinction of such fires, was discussed at a joint meeting of the Institute of Petroleum and the Institute of Fire Engineers, in London recently. The experiments reviewed were carried out by a group of workers on behalf of the Fire Research Organisation—which is run by the DSIR—combining with the Fire Officers' Committee.

" The Application of Air Foam to Oils Burning in Bulk," was the subject of the first paper presented. Part 1 of this, by Messrs. J. H. Burgoyne, L. L. Katan and J. F. Richardson, of the Department of Chemical Engineering and Applied Chemistry, Imperial College, London, discussed general effects with representative petroleum oils, and the way in which the application of air foam extinguished burning oils.

Burning Characteristics

The mechanism was found to depend on the burning characteristics of the oil and on whether the foam was applied from above the burning surface or by base injection. With an adequate rate of top application to an oil having a surface temperature during burning of not more than 100° C. (benzole, motor spirit), a blanket of foam could form at once and appeared to extinguish the fire chiefly by interrupting the transfer of heat from the flames to the oil surface, hence preventing volatilisation of the fuel.

If the surface temperature were above 100° C. it must be reduced to that figure (accompanied by foam breakdown) before a blanket could form. In some instances (heavy lubricating oil) fires were extinguished before the latter condition was achieved, but in others (gas oil) the surface temperature necessary for extinction was below 100° C. and a blanket must be formed before extinction occurred.

With oils that formed a high temperature hot zone during burning, the hot zone must be cooled to a certain temperature (about 130° in the case of Pool fuel oil) before the flames subsided. This cooling by the foam resulted in vigorous frothing, but there was no question of blanket formation. When the foam was applied to Pool fuel oil by base injection, the cooling of the hot zone was augmented by a stirring effect which mixed underlying cold oil with the hot.

If the application were slow, extinction occurred at a hot zone temperature of 130° C., but if rapid, at lower temperatures, when, however, it was supposed, the surface temperature had just reached 130° C. These effects were thought to be associated with the " temporary " and " permanent " extinguishing effects noticed with this type of oil in previous air-stirring experiments.

Pool Fuel Oil

Part II of the paper, by Messrs. Burgoyne and Richardson, discussed the comparison of top and base application to Pool fuel oil, extinction by the two methods having been studied quantitatively on a 40-gallon scale. The authors said that the numerical results were, of course, peculiar to the conditions of experiment; but their general conclusions were:—

To achieve extinction in any length of time, foam from overhead must be applied at above the minimum rate necessary to absorb the normal heat input from the flames to the hot zone. Above this rate, the time for extinction was related directly to the amount of hot zone to be cooled (i.e., time of previous burning) and inversely to the rate of foam application.

The extent to which frothing occurred was related directly to the amount of hot zone present (i.e., time of burning) and to the rate of application of foam from overhead, although the extent of frothing tended to a limiting value at high application rates for a given depth of hot zone.

Foam Rate

With base application, the minimum foam rate necessary for extinction was lessened on account of stirring, which caused cold oil to mix with the hot zone and assist in cooling it. Above the minimum rate the relationship between extinction time and foam rate appeared to be discontinuous at moderate rates, owing, it was thought, to the " temporary " and " permanent " extinguishing effects of stirring. At low rates of application there was little difference in the frothing effects due to top and base application, but at high rates the latter caused much the more extensive frothing.

Illustrating some of their experiments, the authors showed froth coming over the side of a burning tank and the slopover of burning oil, which could reach alarming proportions even in experiments with small tanks.

The second paper, by the same three authors, on "The Use of Solid Carbon Dioxide to Extinguish the Burning of Liquids," discussed some work, the main purposes of which were to examine the effect of solid CO_2 on inflammable liquids, and to determine the best method of application in relation to the character of the liquid concerned. The experiments showed that solid CO_2 might have a certain practical value in dealing with burning liquids, its usefulness depending on the character of the liquid and on the employment of the appropriate method of application. In general, its mode of action depended on the size grading.

Surface Temperature

Powdered material, and in some cases small lumps, floated on the burning liquid and cooled the surface. In those circumstances the effectiveness of the application was, broadly, increased as the liquid surface temperature (final boiling point) and extinction temperature (which was closely related to the fire point) were greater, provided that a hot zone was not formed.

Larger grades of solid CO_2 sank in the inflammable liquid, and their evaporation caused an effect similar to that of air stirring. Liquids of high surface temperature and those which formed a hot zone were more effectively treated by this method than by the surface application of fine material, except that an edge fire (maintained primarily by the heat of the vessel walls) might be left, requiring extinction by auxiliary means.

Large Tanks

The third, and final, paper, by Mr. E. Thornton, a Fellow of the Institute of Petroleum, Licentiate of the Institution of Fire Engineers, and honorary consultant to the latter body on oil fires, dealt with "Some Practical Aspects of the Problem of Applying Foam to Large Tanks." As a memper of the appropriate committee of the DSIR during the war, he collaborated with Dr. Burgoyne's group then, and he is in charge of fire protection at the Llandarcy refineries and properties.

Acknowledging that there was now little question that during the early stages foam in adequate quantities would extinguish fires in tanks or reservoirs of oil or petrol, and that there were several types of foam commercially available for the purpose, Mr. Thornton discussed the technical difficulties of getting foam on to fires at an early stage and at an adequate rate when they occurred in very large tanks, i.e., over 80 ft. in diameter. He dealt with some solutions and tried to assess the trend of future developments.

Mr. Thornton pointed out that very large tanks required inordinate amounts of foam and complicated the problem of overhead application, requiring many fittings and much pipework along conventional lines, and large tenders if mobility of generators was sought with minimum pipework. Larger and lighter pipes and limited points of entry, he said, seemed worth consideration.

Base injection Mr. Thornton referred to as attractive on account of the lower quantity of foam required and greater certainty of entry; the possibility of eliminating all extra pipework became possible and practicable as foam-making plant could work against higher back pressures.

In a discussion of the hydraulics of getting foam through pipes of considerable length, Mr. Thornton said a solution to the problem which involved the installation of one major generator of foam at the product pump-house, with quickly made connection to the product lines when required, and which necessitated no further man-power than the pumpsman who had to start it, would be something like ideal, and demanded careful consideration; and he went on to discuss the problems involved in the pipes and generator.

Air-Foam Generators

In a reference to portable foam devices, Mr. Thornton urged that they should have means of elevating plain pourers, foam being generated at ground level and outside the bund. With the new type high pressure air-foam generators it would seem most attractive, he said, to provide a light extension ladder to carry up a pourer head or nozzle connected by a length of 50 ft. or so of 6in. flexible hose to the generator base, the generator to be supplied with compounded water from pump or tender located outside the bund wall.

Mr. Thornton's paper contained the suggestion that the oil industry, collaborating with other interested parties, e.g., insurance companies, government research and service departments, should stage large-scale tests to put the matter on an adequate technical foundation.

TAR'S VALUE TO THE CHEMIST

History of Application and Development

THE carbonising industries, represented by nearly 1000 gas works and nearly 80 coke oven plants, are the source of two major by-products, benzol and tar.

These are of paramount importance to the chemical industry, so much, indeed, that the whole structure of the synthetic dyestuffs industry has its foundation in coal. In addition, the explosives, plastics, paints, and lacquers, pesticides, pharmaceuticals and other industries use raw materials emanating from the same source.

From benzol and tar we obtain the products generally termed coal carbonisation products or coal chemicals.

The chemical field embraced by these materials covers such diverse commodities as motor spirit, T.N.T., aspirin, nylon, dyestuffs, plastics, perfumes, fruit tree washes, and many others.

Altogether some 200 substances have been separated from tar and over 2000 tar derivatives have been obtained.

The history of the development of tar and a comprehensive survey of its many potentialities and diverse applications in industry, have been described by F. R. King, in the September issue of *Road Tar*, (3, 5), quarterly publication of the British Road Tar Association, from which these abstracts are taken, with permission.

Distillation

From roughly 40 million tons of coal carbonised in this country, nearly 2¼ million tons of tar is produced, and today practically the whole of this crude tar is distilled.

Charles Mackintosh, who introduced the garment bearing his name, is reputed to have brought about the first authentic record of tar distillation on a commercial basis, for Mackintosh used coal tar naphtha for the rubber solution required to join his fabric. The particular naphtha is still known as solvent naphtha.

Tar distillation progressed on an appreciable scale with the discovery of the value of creosote as a timber preservative, but the real interest in tar as a source of organic chemicals was raised to a high degree by Perkins' accidental discovery of aniline mauve in 1856.

In the last weeks of the Crimean War, Perkins, then only 18 years of age, was working at Shadwell, in the East End of London, where attempting the synthesis of quinine, he failed, but one experiment yielded a reddish powder. His Professor, Hoffman, advised him to throw it away, but fortunately the advice was not taken. This was the discovery of the coal tar dye and the first coal tar dyestuffs works was opened at Greenford Green in the year 1857.

The subsequent development, and the reasons which enabled the great prize of synthetic indigo to pass to Germany is another story. It is, however, of interest to record that the necessity of finding an alternative to natural quinine in the last war led to the discovery of Paludrine utilising the field of research created by Perkin's original discovery when looking for synthetic quinine.

Primary Raw Materials

By 1872 tar was being distilled for the recovery of benzol, toluol, naphthalene and anthracene, and these four were still primary raw materials for the chemical industry. With the advance of chemical knowledge, many other compounds were identified and separated, whereas in the early days tar was burnt and dumped.

The growing interest in the by-products, commencing with the patent for a naphtha lamp in 1848, to the development of the dyestuffs industry, together with the further use of benzol in the internal combustion engine, continued to foster distillation of tar, and the recovery of by-products.

Within the chemical industry, benzol, with the addition of nitric acid, becomes nitro-benzol, and with cast iron borings discarded by the engineering workshops, is turned into aniline oil.

Dyestuffs

From this latter product developed a large number of aniline dyestuffs and this was the synthetic dyestuffs industry which had its romantic conception in Perkin's discovery in 1856, after Faraday's original discovery of benzol in 1825 had opened up what eventually became the brilliant field of organic chemistry.

Typical of the swift development of tar derivatives were the researches by Professors Wynne and Armstrong, who in the

10 years 1886-96, discovered a number of naphthalene derivatives, amounting to no less than 465 products.

Benzol is utilised at some stage or other in the majority of synthetic colours, while other uses cover synthetic phenol (carbolic acid) and the more recently introduced synthetic rubber.

Closely related to benzol is toluol, ingredient of the well-known explosive TNT, and also an important base for dyestuffs.

Xylol is used extensively in dyestuffs, paints, varnishes and finishes of the lacquer type and is also a source of synthetic perfume of the musk variety. Naphtha completes the light oil list and is used as a solvent, especially in the paint trade.

Pyridine

Another product obtained in this range is pyridine, from which the sulphapyridine drugs are made. It is also used as a water repellent in textiles and in rubber accelerators.

The next cut from tar distillation is that of the middle oils, the fraction distilling over between 170° and 225° C., and it is here we obtain the important carbolic oil and naphthalene oil. The former provides the tar acids from which is produced the important product phenol. This is known as natural phenol to distinguish it from the synthetic phenol produced from benzol.

In this group, we have the cresols, cresylics and xylenols. Lister, developing antiseptic surgery, first used phenol, then generally referred to as carbolic acid, in 1865 for that purpose. The product had been originally produced for the dyestuffs industry, and is, in fact, still used by it. Apart from phenol's main outlet in the plastics field, it is also the starting point for a route which eventually produces nylon. It is the source of many salicylates of which aspirin is the best known.

Cresol

Among the other tar acids, cresol in the meta rich grade is used extensively—and in fact is second only to phenol—in the plastics industry. Synthetic resin finishes and dyestuffs also consume cresols, while a more recent application in the form of orthocresol finds a big outlet in weed control.

Cresylic acids are used in considerable quantities in the home and export markets for sheep dips, insecticides, disinfectants and detergents, in addition to which quite a tonnage is used in ore flotation processes for the refining of minerals.

The second cut in the middle oils, the naphthalene oil, is of particular importance to the chemical trade. Familiar with the moth repellent naphthalene ball and as a firelighter, it is second only to benzol in the dyestuffs industry. This is a raw material for the production of beta naphthol, phthalic anhydride and a large number of dyestuffs intermediates.

Phthalic anhydride runs into an important field of plasticisers and synthetic finishes in the plastics and paints industry and in dimethylpthalate provided the delousing treatment of the last war. Naphthalene is also utilised for the dressing of hides and for horticultural specialities, together with the production of insulating waxes and alternative solvents to white spirit and turpentine.

The next fraction gives us the bulk of the creosote and anthracene oils. Creosote, the well-known timber preservative represents, outside of pitch, the main constituent of tar, and naturally enters into the economics of tar distillation to an over-riding degree.

Apart from timber preserving, a considerable proportion of the U.K. production is hydrogenated into aviation and motor spirit. During the war years, creosote found a new outlet; blended with pitch it provided the creosote-pitch fuel, which many industries utilised and, in fact, continue to do so.

Anthracene Oils

Creosote and anthracene oils also supply the fruit tree washes which account for a very important tonnage, while from anthracene are provided the important rich alizarine colours which feed the textile demands, particularly for Eastern markets.

A one time burden to the tar distillers, pitch now finds a ready outlet, mixed with coal dust or otherwise unsaleable fuel to make briquettes, a market of considerable dimensions which fell away just prior to the last war, but has now recovered. Apart from the creosote-pitch fuel already referred to, pitch is also used for electrodes and cable production, coating material for roofs and floors and in road dressings.

While this survey of the recovery and application of tar derivatives is by no means complete, it may help to emphasise the importance of by-product recovery to the chemical and allied industries.

The Chemist's Bookshelf

CHEMISTRY OF SPECIFIC, SELECTIVE AND SENSITIVE REACTIONS: F. Feigl, translations by R. E. Oesper. 1949. New York: Academic Press, Inc. London: H. K. Lewis and Co., Ltd. Pp. xiv + 740. $13.50.

The appearance of any book by Dr. Fritz Feigl must be regarded by analytical chemists with more than ordinary interest. It is not an exaggerated view to see the present work as one of the major events of the last few years, for those interested in this branch of chemistry. At first sight the range of the work appears to correspond closely to that of the theoretical part of Dr. Feigl's earlier *Qualitative Analyse mit Hilfe von Tüpfelreaktionen*, later published separately in English translation as *Specific and Special Reactions*. It is, however, clear that extensive re-writing and expansion must have been involved, since it now requires 740 pages to cope with topics which in 1940 were discussed in 190 pages. The first major increase is in the chapter now entitled Types of Complex and Co-ordination Compounds which Play a Rôle as Reactants and Products of Reaction in Analytical Processes. This has grown from 27 to 44 pages, the extension being due principally to the inclusion of two sections dealing with organic molecular compounds and with complex compounds of undefined stoichiometric composition.

In the next chapter, on the Masking and Demasking of Reactions, an increase from 11 pages to 42 is due largely to the inclusion of many more examples of the former phenomenon, but there is also an appreciable section on demasking, a topic not dealt with before. The chapter on Enhancement of Reactivity is expanded by about one-half by fuller discussion and an increase in the number of examples cited.

The largest reconstruction is seen in the chapter on the Effect of Certain Organic Groupings on Specific and Selective Activity of Compounds in Inorganic Analysis—an increase from 33 pages to 202 pages. Great strides have been made in the past few years in the investigation, reflected by the increasing number of monographs and papers dealing with the subject. The topic is here dealt with in detail and with authority.

A consideration of the same problems as applied to organic analysis forms what is in effect a completely new chapter. Although this aspect of the theory of selective reactions has, as yet, received little attention, it may be presumed, reasoning from the increase in the inorganic field, that considerable developments are to be expected in the near future. This justifies the segregation of the topic in a separate chapter, rather than its inclusion in a chapter dealing primarily with topics of inorganic interest.

The chapters on solution and on weighting effects have also been increased to rather more than double their original size. The next major increase is in the chapter on Surface Effects in Analytical Chemistry, which replaces that originally entitled Capillary Phenomena in Spot Reactions. This latter subject now rightly forms only one section in the discussion of a wide variety of phenomena which fall into the confines of surface chemistry, and the increase from 17 pages to 180 is fully justified, permitting a discussion of such factors as particle size, colloidal behaviour and adsorption.

A new chapter of 58 pages deals with the influence of physical and chemical conditions on the nature of precipitates, and with the allied problem of localised reactions. Finally, the chapter on fluorescence analysis is increased from six to 24 pages, and includes an interesting discussion on photochemical phenomena in relation to spot reactions.

The book, as one has come to expect with Dr. Feigl's works, has very full author and subject indexes. On looking at the author index, it is obvious that Dr. Feigl has himself taken a very considerable part in the researches in this field. What may not be so apparent, however, is how much the theoretical development of the field owes to his work over many years. This book shows that he still may claim to be the acknowledged master in the branch of analytical chemistry which he can be said to have initiated.

HOME

Cargoes for Britain

Cargoes, financed by Marshall Aid, due to arrive in Britain at the end of last week, included: Steel 10,750 tons; aluminium 8551 tons; zinc 800 tons; and copper 755 tons.

Mineral Wool

The Dinorwic Slate Quarries, Llanberis, the largest of their kind in the world, may be producing mineral wool from slate waste before the end of the year. Output will be on a very large scale and, as the wool is non-inflammable and its melting point is very high, good industrial demand is anticipated.

K.I.D. Exemptions

The Treasury has made an Order exempting from Key Industry Duty the following amyl alcohol: pentanol - 2; and the following hexane diol: 2 - methyl - 2, 4 - pentane diol, for the period beginning September 19 and ending December 31. The Order, entitled "The Safeguarding of Industries (Exemption) (No. 6) Order, 1949," is published by H.M.S.O., price 1d.

Industrial Instruments on View

The engineering aspect of its business, is in future to be featured in the window display of its London showrooms by George Kent, Ltd. The firm, whose industrial instruments, manufactured at Luton, now represent the greater part of its output, also has a factory in Wales and branches overseas in South Africa, Australia and Penang.

Shell Chemicals in Scotland

With their Scottish Divisional office now fully established at 28, St. Enoch Street, Glasgow, Shell Chemicals, Ltd., are now dealing direct with orders for the Teepol group of wetting agents and detergents for the industrial solvents now coming from the Shell plant at Stanlow. Mr. C. Duckworth is the divisional manager, and the telephone number of the Glasgow office is Central 9561.

Coal Production

There was a fall of 8400 tons in Britain's coal production last week compared with the previous week, but output was 181,900 tons higher than in the corresponding period of last year. Comparative figures are: Last week: 4,229,100 tons (deep-mined 3,955,100 tons, opencast 274,000 tons). Previous week: 4,237,500 tons (deep-mined 3,967,200 tons, opencast 270,300 tons).

Institution of Chemical Engineers

Particulars of the Associate Membership Examination for 1950 and application forms (returnable December 1, 1949), may now be obtained from the Hon. Registrar, Institution of Chemical Engineers, 56 Victoria Street, London, S W.1.

New Distribution System

Laporte Chemicals, Ltd., is closing its premises at Lidget Green, Bradford, and after September 26 this branch of the business will be conducted from the works of the subsidiary, John Nicholson & Sons, Ltd., Hunslet, Leeds. Stocks will be held at Hunslet and deliveries effected in the same manner as previously from Bradford.

ECA Post-Graduate Scholarships

The Treasury announced last week that some 50 post-graduate scholarships are to be awarded for the study of technology at selected universities and technological institutions in the U.S.A. in February, the cost being met from ECA funds. The awards are open to students who hold a good honours degree in pure science or technology, and are now working in industry or research associations or teaching in universities or technical colleges.

Import Licensing Office

The Import Licensing Department of the Board of Trade (with the exception of the machinery section and the staff dealing with European Recovery Programme claims) transferred, as from Monday, September 19, from its premises in Regent Street, London, W.1, to Romney House, Tufton Street, Westminster, London, S.W.1. (Telephone: Abbey 9080). The machinery section and the staff dealing with ERP claims will remain at 91 Victoria Street, London, S.W.1. (Telephone: Abbey 7898).

Efficient Ironfoundries

To promote greater efficiency in foundries a research team is to be set up by ironfounding employers in conjunction with the British Cast Iron Research Association and the Council of Ironfoundry Associations. The team will be available to visit any foundry by invitation, and confidential reports will be made to the managements on any steps that may be needed to improve performance. An executive with experience in management and costing, an engineer for planning and mechanisation, and a metallurgist will be among the first staff to be appointed.

RESEARCH WORK IN AUSTRALIA

Wide Demands on the DRL

THE increasing and varied work of the Australian Defence Research Laboratories (formerly Munition Supply Laboratories), is described in the annual report for the year ended June 30, 1948, now made available by the Minister for Supply and Development, Senator J. I. Armstrong.

The work of the DRL, which has headquarters at Maribyrnong, Victoria, covered a wide range of investigations, and was distributed 40 per cent for the Supply and Development and Services departments, 23 per cent for other Government departments, 16 per cent for private industry, and 21 per cent on broad researches affecting all these groups.

New branches of the DRL are being developed in New South Wales and South Australia.

Some idea of the diversity of the demands made on the DRL is given in the following summary of the report (*Chemical Engineering and Mining Review, 41*, 341).

Weathering of Paints

The paint laboratory has continued its study of the weathering of paints in various Australian climatic zones. A programme of tests has been started to investigate the formulation of roof paints to suit Australian conditions. Paint-holding properties of Australian timbers are also being investigated.

A systematic study is being made of drying oils obtained from seeds of native and cultivated flora in Australia and other south-west-Pacific areas. Oils with valuable properties have been found which promise to be useful substitutes for imported products.

Studies have been made and are continuing of the deterioration of lubricating oils in internal combustion engines and of the effect on engine and oil economy of the use of oil filters.

Investigations are being made into the degradation of cellulosic materials by fungi and into methods of proofing them against attack.

DRL has received many requests from Government and private establishments for help in assessing health hazards in industry in the shape of toxic vapours and dusts.

Investigation is in hand to develop equipment whereby unskilled workers can quickly and easily detect dangerous concentrations of toxic materials in the atmosphere of factories.

Assistance has been given to industry in overcoming a wide variety of problems met in casting, forging, cold working, welding, heat treatment, and corrosion-protection of metals and alloys and in their use in engineering, domestic and other applications.

Metals

Facilities include an experimental foundry recently set up for the investigation of problems in the casting of metals, X-ray equipment for detection of defects in castings and in welds, and a laboratory for investigational work in electroplating and electro-polishing of metals.

An investigation has been in progress into the effects of surface treatment of steel on its fatigue characteristics.

It has been found that shot peening (the bombardment of the metal surface by fine shot under controlled conditions) is of considerable value in lengthening the life of metal parts subjected to high stresses.

Much work has been done on the designing of lens systems for special purposes.

The optics laboratory has been experimenting with the techniques of interference and phase-contrast microscopy which have been recently developed overseas. These techniques greatly increase the performance of the microscope in the examination of specimens of low optical contrast.

Optics

The laboratory is developing suitable methods for constructing the necessary optical parts for these branches of microscopy.

Demand for checking and calibration of instruments on behalf of other laboratories has continued. This service includes checking of gauges and length sub-standards used to control precision manufacture, and the calibration of electrical instruments, thermometers and pyrometers, testing machines, balances, and weights.

It is expected that this work will increase when registration of laboratories by the National Association of Testing Authorities begins.

Growth of the Indian Plastics Industry

Production of 3000 Tons of Finished Goods Annually

THE Indian plastics industry, which was born during the recent war, to-day produces over 3000 tons of goods annually. Total investments of Rs.50 million have been made in the industry, which has 70 factories employing 10,000 workers, according to statistics recently released by the All-India Plastic Manufacturers' Association.

The consumption of plastic goods in India has risen steadily from 500 tons in 1939 to 4000 tons in 1948-49. Plastics have, apparently, come into use in every walk of life in India. The industry has, however, had to depend entirely upon foreign countries for moulding powders and other raw materials. In the financial year 1948-49, about Rs.3.5 million worth of raw materials were imported, moulding powders alone accounting for Rs.2 million.

Competition from Abroad

Besides this handicap, the industry had to face stiff competition from the U.K. and the U.S.A. The Indian market has, in fact, been virtually flooded with plastic goods from the U.S.A., the largest manufacturer in the world in this field, with the result that the All-India Plastic Manufacturers' Association sought tariff protection from the Indian Government this year.

The Government's Plastics Advisory Panel has recommended that the nation's resources of raw materials necessary for production of finished goods be fully exploited. The panel states that India is favourably placed for the raw materials for the synthetic plastics industry. There is, in addition, an abundance of naturally occurring resins and resin-forming materials.

Moulding Powders

A delegation of the All-India Plastic Manufacturers' Association, with a technical adviser of the Indian Government, toured the U.S.A. and the U.K. this year to study the latest developments and methods of manufacture. In its report to the Government, the association stressed the need for the immediate establishment of a central factory to manufacture moulding powders.

The Indian Government is now experimenting with the manufacture of urea and phenol, and two of the essential raw materials for the industry. A start has already been made in basic research by the Indian Council of Industrial and Scientific Research. The Department of Chemical Technology of the University of Bombay has also started a course on plastics manufacture.

Meanwhile, the Indian Tariff Board has submitted its recommendations on the extension of protection to the plastics industry, and the government's decision is awaited.

Chemical Raw Materials

Mr. R. Srinivasan, plastics development officer to the Government of India, has stated that the shortage of chemical raw materials in India is a big handicap to the plastics industry. Referring to the small advance made in the moulding branch of the industry, Mr. Srinivasan suggests that, consistent with the availability of foreign exchange, it would be desirable to allow the natural expansion of this branch of the industry by permitting imports of equipment and raw materials. Moulds could be made more economically in India, he suggested, provided the necessary technical assistance for their design and production was obtainable from foreign countries.

Mr. Srinivasan revealed in a recent report to the Government, that some of the firms specialising in mould making in the U.K. and in the U.S.A. had indicated their willingness to participate in a joint venture with Indian firms for the establishment of a mould-making plant in India.

Australian Iron and Steel Plan

THE possibility of the establishment by American steel interests of new departments of the iron and steel industry in Western Australia is being given close examination by an American company, according to the Australian News and Information Bureau, New York. At present, an American steel mill expert, Mr. H. C. Lenhart, vice-president of H. A. Brassert and Company, consulting iron and steel engineers of New York, is in Perth to investigate prospects. A steel authority has reported in Sydney that H. A. Brassert & Co., has a lease of half of Koolan Island, in Yampi Sound, Western Australia. The lease contains an estimated 90 million tons of iron ore.

• OVERSEAS •

Hungarian Scientific Glassware

A new type of heat and alkali resistant glass having chemical uses is being manufactured in Hungary by the Nagykanizsa Glass Works under the name Pirover.

South Africa's Petrol Rationed

The low state of petrol reserves in South Africa, as was expected, has led to the introduction of rationing. The form of restriction to be applied will probably be announced shortly.

Uranium Buying Pool

The Australian Government has set up a buying pool to encourage the mining of uranium, Senator Armstrong, Minister for Supply, stated in a recent broadcast. The pool is based on purchasing schemes which had been announced by Britain, the U.S.A. and Canada.

Guarantee to German Scientist

Professor Stieve, the anatomist of the Humboldt University in the Russian sector of Berlin, has been given a guarantee in writing by the Soviet Department of Education that in future he will be given full freedom to publish the results of his researches. The professor had notified the authorities of his intention to resign unless he was assured of freedom of scientific research.

Reopening of Haifa Oil Refinery

Technicians of Consolidated Refineries, Ltd., are said to be inspecting its plant at Haifa in preparation for resuming operations early next month. According to a *Times* correspondent, the first tanker from Cardón, Venezuela, was expected on 15 September and unloading was planned to begin three days later. Relations between the company and the Israeli Government are reported to be cordial.

Antrycide Tests

First tests with Antrycide, which, it is thought could possibly make nearly 6 million acres of Africa safe for beef cattle, have proved "fairly satisfactory," Dr. S. C. Hassan, senior veterinary officer of the cost province of Kenya, said at Mombasa on September 12. A 6-month experiment with the drug had been made at Gedi, worst spot for the tsetse fly on the East African Coast. Twenty-six beasts inoculated were in excellent condition. One died three weeks after having been inoculated.

Air Pollution Symposium

Research institutes and universities are collaborating to organise the largest symposium yet held in the U.S.A. on air pollution casues and prevention. This is to be convened at Pasadena on 10 and 11 November. Scientists and engineers will co-operate to provide fundamental information and ideas on methods of analysis and control.

Australian Oil Drilling

Following nine years' investigation of oil prospects in central Queensland, the Shell Oil Company is said to have selected a site for a deep test. It is situated nearly 400 miles north-west of Brisbane, and drilling is expected to begin in December. A British rig, capable of drilling to 10,000 ft., is being installed. The Shell Company representative in Canberra said that, if necessary, drilling would be continued to 10,000 ft.

American Plastics Development

A VINYL plastic motion picture screen, the first of its kind to be installed in America, is now in use at the New York Strand Theatre on Broadway. Made by the Radio corporation of America, it is expected substantially to increase the efficiency of motion picture projection. ECA engineers claim that the screen has no glare. Its composition and finish are said to be so contrived that it will not collect dust, maintaining its high efficiency far beyond the life of previously used materials. The plastic coating is fused to the screen at 400°F. Tests conducted by the Electrical Testing Laboratories, New York City, indicate that the screen is the whitest available, and has the highest reflection efficiency. The material is so flexible that the 18 by 24 ft. screen can be folded without marring the smoothness of the surface coating.

A new type of urea resin glue, said to provide a bond resistant at water boiling point at far lower cost than similar cold-setting glues, is being introduced by the Borden Company's Chemical Division, New York. Specially designed for the furniture and other woodworking industries, it sets and cures quickly, and forms a strong light-coloured bond. Known as Casco Resin 155, it is made with either of two catalysts, one for cold-press operations and the other for hot-press.

PERSONAL

THE appointment of Mr. H. M. Garner to the post of chief scientist to the Ministry of Supply was announced at the beginning of this week.

Mr. Garner, who was born in 1891, has been principal director of Scientific Research (Air), in the Ministry of Supply since 1946.

In 1927 he became senior scientific officer of the Royal Aircraft Establishment, and two years later chief technical officer, Marine Aircraft Experimental Establishment, Felixtowe. He was appointed deputy director of Scientific Research, Ministry of Aircraft Production, in 1943.

Mr. Garner, who is the author of numerous scientific papers on aerodynamics, succeeds Sir Ben Lockspeiser, who was appointed secretary of the DSIR when Sir Edward Appleton took up his post as principal of Edinburgh University (The Chemical Age, *60*, 305).

Professor R. A. Morton, Professor of Biochemistry, in the University of Liverpool, left Newcastle-on-Tyne last week for a visit to Norway and Sweden. The professor will lecture to the Norwegian Physiological Association, and also to the Anglo-Norse Society and the Polytechnic Society for the British Council. In Sweden he will give addresses in Stockholm and Uppsala by arrangement with the University of Stockholm. The subjects of his talks will incude: “ A Provincial British University in the Post-war Period,” and Vitamin A.”

Mr. D. B. Collett, Dunlop’s general works manager at Speke Liverpool has been appointed vice-president and general manager of the Dunlop Tire and Rubber Goods Co., Ltd., Toronto, of which Mr. J. I. Simpson will continue as president. Mr. Collett, seventh son of the late Sir Charles Collett, joined Dunlop in 1936. He became chief labour officer at Fort Dunlop and was then appointed to the Speke factory. He will be succeeded at Speke by Mr. E. E. Quinton, who has been works director of Dunlop South Africa, Ltd., in Durban since 1942.

Mr. J. P. Brierley, technical director of Lever Brothers (Port Sunlight), Ltd., has been appointed technical director of the firm’s South African group, including companies in Rhodesia and Nyasaland. Mr. Brierley, who is a native of Port Sunlight, began his career with the company in 1920. He served in South Africa and Canada, returning to take up his post as technical director in 1947.

OCCA LECTURES

HOW ideas develop in a given field of investigation and how experimental techniques are evolved to follow those ideas will be the subject of a series of three post-graduate lectures to be given by Prof. M. G. Evans.

The series is sponsored by the Oil and Colour Chemists’ Association and will be given on Thursday evenings at the Royal Institution, Albemarle Street, London, W.1, beginning on October 6, at 6.30 p.m.

The first lecture will deal with the knowledge of the kinetics of, and the factors influencing, simple gas phase reactions involving atoms or radicals.

Lecture 2 will cover the special techniques for the study of electron transfer reactions in solution, and the final lecture will discuss the experimental and theoretical aspects of oxidation-reductions, factors influencing such reactions, and the mechanism of ærobic oxidation of ions.

Electronics for Spectroscopists

A SUMMER school planned to meet the needs of spectroscopists requiring electronic techniques and of electronic engineers who have to design suitable equipment was held at University College, Southampton in July.

The success of the school, which was well attended, is shown by the first reports now available. A full account will appear in the bulletin of the Photoelectric Spectrometry Group, which sponsored the scheme, and it is hoped to issue the complete notes of the course in book form.

Professor E. E. Zepler (Electronic Engineering) and Professor A. M. Taylor (Physics) with their staff, gave generous help. Mr. C. G. Cannon was organiser for the group.

Lectures and demonstrations were given by the professors and other members of the University, also by three members of the group.

Chemical and Allied Stocks and Shares

DEVALUATION of the £ was expected in the City sooner or later and did not come as a surprise, but the extent of the devaluation was larger than anticipated, and markets have been more active than for a long time past. Greatest rises were scored by gold mining shares because of the increase in the price of that metal following devaluation of the £, but there were all-round gains in industrials, shares of big exporting companies to the U.S.A. and Canada being the chief beneficiaries.

On the other hand, British Funds and other securities of the fixed interest-bearing type lost ground, although there was no marked selling. Declines in Gilt-edged have ranged up to £2, mainly because the prospects of increased cost of living is tending to keep buyers off fixed-interest stocks in favour of shares which offer scope for capital appreciation and eventual increases in dividend payments.

Devaluation has also resulted in a general rise in base metal mining and commodity shares, particularly rubbers which were higher as a result of the increases in price of the commodity. Later, although business remained active there was a good deal of profit-taking and buying became much more selective. It is generally realised that results of the Washington talks and devaluation of the £ cannot be expected to bring immediately a big expansion in exports, and that exports to America will have to be increased considerably to bring in the same dollar income as before.

Gains have been recorded by leading shares of companies connected with chemical industry, particularly those which have a large export trade. Imperial Chemical have risen by 1s. 3d. to 46s. 9d., British Aluminium by 9d. to 43s. 9d., British Oxygen by 1s. 3d. to 96s. 3d., Associated Cement by 1s. to 78s. 9d., and Dunlop Rubber by 1s. 6d. to 66s. 3d. Biggest gains were in shares of companies which have assets and trading interests in the dollar countries. Turner & Newall, for instance, advanced 4s. to 83s. 9d., while United Molasses at 43s. 9d. were nearly 2s. higher, and Borax Consolidated rose another 3s. 1½d. to 60s. 7½d.

British Plaster Board gained 6d. to 15s. 6d. and the 4s. units of the Distillers at 29s. 6d. were helped by the prospect of increased sales to the U.S., and also by the statements at the recent annual meeting, showing the diversity of the company's interests. An advance of 1s. to 16s. 6d. in Beechams deferred shares was attributed to the view that the depreciation of sterling will mean expansion of the group's export business.

Paint shares were also favoured because of their export and overseas interests. Pinchin Johnson rose 1s. 6d. to 37s. 9d., and Jenson & Nicholson gained 1s., at 27s. Elsewhere, Monsanto Chemical have risen to 51s. 10½d. Wall Paper Manufacturers deferred shares were 6d. up at 41s.; De La Rue have been firm at 26s. 3d.; Kleeman improved to 11s., and other shares of companies connected with plastics were also better. British Xylonite jumped 8s. 9d. to 90s.

Shares of companies mainly identified with home trade also participated in the upward movement. Boots Drug were better at 51s. 3d., Lever & Unilever at 42s. 6d. were litte changed on baance, and Glaxo Laboratories were maintained at £19¾, being firmly held owing to market talk of share bonus possibilities. Triplex Glass improved to 21s. 3d. Iron and steel shares were well supported; Dorman Long at 31s. 6d., United Steel at 27s. 6d. and Stewarts & Lloyds at 54s. 6d. were all better.

There were big rises in oil shares, Anglo-Iranian gaining nearly 10s. at £7⅞.

Organic Fluorine Compounds

A SUMMARY of the researches carried out at Birmingham University in the session 1947-48 is contained in the 19th annual report of the Joint Standing Committee for Research. The immediate funds available to the committee are only small, but are now supplemented by grants from the University's general funds.

Among the wide range of subjects covered, the Department of Chemistry has carried out investigations on polymeric carbohydrates as substitutes for blood plasma and has also completed work on pneumococcus and mycobacterium tuberculosis. A new range of organic fluorine compounds with possible application as non-inflammable lubricants, plastics, etc., resulted from work in fluorine chemistry.

Preliminary investigations into the chemical nature of the resins and the "free carbon" of coal tar, and studies of the vapour-liquid and liquid-liquid relations of the system acetic acid-water-ethyl acetate, were carried out by the Department of Chemical Engineering.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Resinite Products, Ltd., London, W.C. (M., 24/9/49.) Manufacturers of plastic mouldings, etc. August 16, £4000 debenture to Denny Mott and Dickson, Ltd.; general charge. *——. December 31, 1948.

Mortgage Satisfactions

Livingston Refractories, Ltd., London, E.C. (M.S., 24/9/49.) Satisfactions August 20, of first and second series of debentures, both registered April 30, 1940.

Midland Tar Distillers, Ltd., Birmingham. (M.S., 24/9/49.) Satisfaction August 17, of debenture stock registered August 6, 1936, to the extent of £8500.

Increases of Capital

The following increases in capital have been announced: Beecham Research Laboratories, Ltd., from £50,000 to £100,000. Bush, Beach & Gent, Ltd., from £20,000 to £50,000. Greenwood Rawlins & Co., Ltd., from £2000 to £5000. London Fumigation Co., Ltd., from £1000 to £20,000. Standard Oil Co. (Malta), Ltd., from £50,000 to £100,000.

Changes of Name

The following changes in name have been announced: Deo-Dis Service, Ltd., 23 Park Row, Leeds 1, to Convendo, Ltd.; Fairbank Kirby (Wholesale), Ltd., 7 Ropery Street, Grimsby, to Fairbank Kirby, Ltd.; L. Holmes Trading Co., Ltd., 7/8 Poultry, E.C.2, to R. Fisher (London), Ltd.; Mersey Soap Co., Ltd., Unilever House, Blackfriars, E.C.4, to D. & W. Gibbs (U.K.), Ltd.

New Registrations

Blue Farm and Lime Services Company, Ltd.

Private company. (472,886.) Capital £5000. Manufacturers of agricultural lime, fertilisers, manures, chemicals. Directors: G. B. Bull and Mrs. M. L. Bull, Mrs. M. Hinsull. Reg. office: 11 Northolt Grove, Great Barr, Birmingham, 22a.

B. Fillingham, Ltd.

Private company. (472,611). Capital £100. Manufacturers of weedkillers, insecticides, disinfectants, agricultural and other chemicals, manures, fertilisers, etc. Secretary: C. E. Bream. Reg. office: Bank Chambers, Town Hall Square, Leicester.

Industrial Fluids, Ltd.

Private company. (472,910). Capital £10,075. Chemists, oil refiners, oil and colour men, manufacturers in chemical, oil, industrial preparations and preparations for de-misting glass, anti-freeze products, etc. Reg. office: Ibex House, Minories, E.C.

R. E. Pickstone, Ltd.

Private company. (472,597). Capital £100. To develop chemical processes and products, etc. Directors: R. E. Pickstone, J. D. Stalker. Reg. office: 1 Chattern Road, Ashford, Middlesex.

Sully Alginates, Ltd.

Private company. (472,776). Capital £5000. Chemical engineers, chemical manufacturers, manufacturers of marine vegetation and chemicals derived therefrom, etc. Directors: C. W. Bonniksen and J. G. Cronk. Solicitor: M. A. Coombes, 119 High Street, Oxford.

ASLIB President's Protest

THE idea of an Association of Special Libraries and Information Bureaux was born 25 years ago, when a conference was held at which information officers mainly interested in metallurgy met to discuss problems of common interest to all, said Dr. Percy Dunsheath in his presidential address to ASLIB recently.

Asserting that library facilities in science and technology were a disgrace to Britain, Dr. Dunsheath called on the Government to provide a new library in the centre of London "conceived on a grand scale."

Company Meeting

THE DISTILLERS CO., LTD.

THE 72nd annual general meeting of the company was held in the North British Station Hotel, Edinburgh, on Friday, September 16, 1949, when the chairman, Mr. H. J. Ross, presided.

The chairman said:—

Once again I have to open my remarks to you on a sad note. It was only a year ago that Mr. John Barr Cumming, managing director of John Walker & Sons of Kilmarnock and London, was elevated to a seat on the board of the parent company, and not long afterwards he was stricken with a serious illness from which he succumbed, after a very gallant fight, in June of this year. His passing is a severe loss to the company.

Since our last annual meeting, Major Ball, D.S.O., M.C., has been appointed a member of the management committee, and his specialised knowledge of plastics, chemicals, etc., should prove, and indeed is proving to be a distinct acquisition to the deliberations of the committee.

The addition of three new directors to the board also falls to be recorded. These are all full-time executives who have grown up in the service of our subsidiary companies, and whose promotion is the reward of merit. They are, messrs. S. H. Hastie, E. Stein, and W. Walker, whose designations are stated in the report, and whose appointments you will be asked to confirm later in the meeting.

Profits and Taxes

From the statement of accounts you will have noted that, for the year to March 31, 1949, the manufacturing and trading profits of the company and its subsidiary companies, including an item of £149,756 for inter-company profits in the stock valuations of subsidiary companies released during the year, amounted to £10,361,857. To this is added: (1) Income from trade investments £324,956, (2) income from other investments including British Government Securities £400,673, and (3) provisions for taxation made in previous years not required and released £291,094, making the total revenue £11,378,580.

Taxation, under the headings of income tax and profits tax required £5,479,939, and after all provisions for depreciation, writtings off, and allowance for interests of outside shareholders in subsidiary companies, the net profit attributable to the group amounted to £4,756,623, as against a corresponding figure in the previous year of £5,303,510.

There was transferred to the general reserves of subsidiary companies amounts totalling £644,295, and the directors have agreed to appropriate £773,754 to general reserve, and £275,000 to superannuation and provident reserve, both in the books of the parent company. At the same time, the directors agreed to take from investment reserve a sum of £100,000, and to apply this in reducing the book values of certain investments in subsidiary companies.

At this stage, there was available £3,163,574, being sufficient for the dividends distributed or recommended, and to increase carry forwards from £3,425,083 to £4,243,398. The latter figure comprises £1,001,889 by the parent company, and £3,241,509 in the books of subsidiary companies.

Dividend

The dividend on the ordinary stock in respect of the year to March 31, 1949, is 1s. 1 1/5d. per unit of 4s., the same as for the previous year.

Apart altogether from the national policy of restriction of dividends, the board has had to have regard to the somewhat heavy contingent liabilities in respect of uncalled capital on investments, and for commitments for capital expenditure, all as mentioned in the notes attached to the accounts. The board deems it desirable to mention again that the costs of the expansion programme will, when completed, prove to be in excess of the estimates.

The company's legal balance sheet calls for the following comments:—

(1) The general capital reserve is now £1,324,098. The increase here is mainly attributable to the credit for profits on certain investments sold during the war.

(2) The revenue reserves, including undistributed profit, total £14,733,432.

(3) Investments in subsidiary companies increased during the year by £598,993. The main items contributing to this are as follows:—

(a) The subscription of additional capital to one of the subsidiary companies in the industrial group towards financing the costs of further development of that company.

(b) The acquisition of the firm of R. G. Abercrombie & Company, Distillers' and Brewers' Engineers, Alloa, and the creation, in collaboration with other interests, of a subsidiary company with a capital of £25,000, of which 80 per cent is held by The Distillers Company, Ltd.

(c) The investment in Uni-Be Bakers Supplies, Ltd. Here the capital is £50,000 of which 60 per cent is held by The Distillers Company, Ltd.

and

(4) There is a substantial reduction in the book value of quoted investments, under the heading of "Current Assets" in the balance sheet. Certain holdings of gilt edged securities and equity shares of British companies have been sold, mainly to finance loans to subsidiary companies for the expansion programme. The market value of the remaining holdings was below book value at the date of balance, but, in the case of trade investments, there was a very substantial surplus over book values. Having regard to this, the board did not consider it necessary to write down the value of quoted investments.

Reserves and Assets

Turning now to the consolidated balance sheet, it is interesting to note the increases in lands and buildings and in plant and machinery, due to the expansion programme. The effects of the appropriations to reserves and the increases in carry forwards are reflected in the comparative figures showing increases for both capital and revenue reserves. The strength of the organisation is clearly shown with current assets over £57 million and current liabilities of under £9.8 million.

It is appropriate to mention that the liquidation of W. P. Lowrie & Co., Ltd., and the transfer of its assets to James Buchanan & Co., Ltd., has brought about a reduction of £983,729 in the group's revenue reserves, with a corresponding increase in the group's capital reserves.

During the year, the board received an actuarial report upon the group superannuation and provident scheme. After taking into account the income tax position which would be applicable if a separate trust was established, the valuation has disclosed that the existing reserves, under this heading, are adequate—in fact, there is a surplus.

The board will shortly have under consideration the formation of such a trust to administer certain provisions of the scheme.

In recent years, the stockholders have been informed that the board desired to re-organise the capital structure of the company, at least to some extent, so as to bring the issued capital more in line with the assets, and with the earnings. The proposal as announced—to capitalise £7,512,923 of the company's general reserve, and to appropriate this to the ordinary stockholders on the register at September 30, 1949, by the allotment of one new ordinary share (afterwards to be converted into stock) for every two pounds of ordinary stock held—has received the sanction of the capital issues committee of the Treasury.

Arrangements are being made to hold an extraordinary meeting on Thursday, November 3, 1949, to consider this proposal, as well as one to increase the capital of the company from £20 million to £35 million.

The transfer of £7,512,923 from the general revenue reserve of the parent company leaves a substantial figure at credit thereof, and the board considers that this, in conjunction with the reserves of subsidiary companies, leaves the organisation strong, and in a position to withstand such contingencies as may arise in the future.

In my statement last year I referred to the release of 250,000 tons of cereals to the industry for the period to April 30, 1949, and for which quantities, licences were issued to maintain continuity of operations at distilleries.

This release was followed in February of this year by an allocation of 300,000 tons, equal, you might say, to the full pre-war rate of distilling, but, to achieve this, we were obliged to pledge ourselves to still further increase our exports of old whisky.

Home Market

Reference was also made last year to the limited and indeed meagre allocation being made available to the home consumer. In the year now under review, the position has not improved.

In terms of the arrangement with the Ministry of Food which came into operation on May 1, 1948, releases for the home trade had to be confined to an overall figure for the trade of two million proof gallons, and, although the official figure of releases showed that total to have been considerably exceeded, our companies faithfully observed the arrangement.

At a meeting with the Ministry of Food in February, 1949, the necessity for increased home trade supplies was submitted with the utmost emphasis. Once again, however, the interest of the home market had to be submerged in the national necessity for increased supplies to hard currency export markets, and, for the twelve months ending April 30, 1950, home trade releases have again been pegged at two million proof gallons.

I need not reiterate the feelings of the board which I expressed to you last year, except to repeat that it is our aim and desire to have the position remedied at the earliest possible moment.

The rate of duty remains at the ridiculous figure of £10 10s. 10d. per proof gallon. Continuance of taxation at this penal rate—equal to 24s. 7d. per bottle—coupled with the restricted releases already referred to, can only result in the strangulation of our home trade interests. The representations to the Chancellor of the Exchequer made during the course of the year must be intensified, not only on our part, but by ancillary interests, including the consumer public.

To return to exports, as I think is generally well known, the U.S.A. and Canada are the most important hard currency markets upon which we are asked to concentrate our efforts. While our group of companies will naturally carry out their share of the undertaking made between the Ministry of Food and The Scotch Whisky Association, it has been impressed on the Minister that consideration must now be given, not only to the long suffering home consumer, but also to certain other soft currency markets which have been deprived of their full requirements for years.

What we must ever impress upon the Government of this country is that the Scotch whisky industry, and your company in particular, has been responsible for creating a world-wide trade in an article, the quality of which is second to none.

High Duty

The undoubted supremacy of Scotch whisky is acknowledged everywhere, but continued shortages will assuredly open the door to substitutes of one kind or another, of which there are many in various countries of the world. Particularly has this been the case in the home market, due largely to the exorbitant rate of duty.

For economic reasons, certain countries, notably the South American Republics, have been closed to us as markets for our brands of Scotch whisky.

The arrangements we have made to endeavour to protect our valuable trade in South Africa appear to have excited comment in some quarters. As you will be aware, the South African Government, in the interests of their internal economy, recently prohibited the importation of a long list of luxuries, including whisky.

Our efforts to be allowed to export even a token quantity having met with no success, we were informed that the only possible way in which a resumption of trading might be achieved would be for us to agree to leave our money in South Africa to be invested in Union Government and Municipal Securities, or other approved investments, for a period not yet known.

Naturally, the prospect of tying up our resources in such a manner over an indefinite period held no particular appeal, but, as the only alternative left to us was the probable loss of what has been for long years a most valuable market for Scotch whisky, we decided to give this blocked fund system a trial. The matter was therefore remitted to the Bank of England Exchange Control, and the necessary permission granted.

I am glad to be able to record once more that the demand for the group's gin brands continues strong—particularly the leaders—Gordon's and Booth's, which reflects the public's appreciation of the high standard of quality which it is our endeavour always to maintain.

In addition to the continuing efforts of our gin companies to expand exports to hard currency markets, we have in the U.S.A. our own rectifying plant, where our sales are running at a higher level than they have ever done, and those of our directors and others who have recently been in America have nothing but praise for the condition and operation of our factory at Linden, New Jersey.

Production at the company's yeast factories was at a high level throughout the year, but costs have again tended to rise. It is satisfactory to record that the Ministry has given permission for the erection of the new factory at Bristol, and every effort will be made to have it in operation within a reasonable period.

The United Yeast Company Ltd., and its associated companies, who are distributors of the company's yeast to every district of the United Kingdom, no matter how remote, as well as engaging in the important business of providing most materials used by bakers, have well maintained their progressive position with satisfactory results.

Industrial Section

The past year has been a difficult one on the industrial side of the company's business, but, on the whole, our combined results have been satisfactory.

The demand for industrial alcohol and chemical products has been substantially maintained, and I am glad to say that, during the course of the first half of 1949, all Government controls, which have been in force in respect of most of our manufacturing and selling operations during and since the war, were removed.

The world price of one of our important raw materials, molasses, fell very sharply at the end of last year, so that, notwithstanding the necessary liquidation of high-priced stocks, the recent purchase at much lower prices has enabled us to make substantial reductions in selling prices of the materials derived therefrom, and thus bring them more into line with the increasingly competitive conditions following upon the disappearance of the sellers' market.

The indications are that molasses is likely to remain in free supply at reasonable prices for some time to come, which will enable us to make further reductions as and when the old stocks are disposed of.

The new project at Grangemouth for producing chemicals from petroleum, which development you will recall is being financed equally between the Anglo-Iranian Oil Company, Ltd., and ourselves, is making steady progress. Although the rising costs of constructional materials and long delivery dates still present serious problems, nevertheless, every effort is being made to adhere to the original completion date of January, 1951.

Expansion Scheme

The penicillin factory at Speke has had a satisfactory year, and the entire output has been fully sold. Plans are now in course of execution for considerably increasing the existing capacity, having regard to what we believe will be the future demand for penicillin, and also to equip the company with the most economic basis of manufacture in order to meet increasingly competitive conditions in world markets. The programme also provides for the marketing of new materials in the course of next year.

The plastics industry, as a whole, has suffered a sharp set-back during the past year, due, in no small measure, to the operation of the purchase tax as well as the high cost of essential raw materials. In recent months, however, the prices of some of these raw materials have eased, and there have been signs of an improvement in demand.

In the meantime, our new factory at Barry is virtually complete, and the gradual transfer of manufacturing operations from existing plants to that centre is now in progress. This large and modern unit should enable us to achieve further economies in production cost, and also considerably to expand and broaden the present range of plastic materials.

The Geon polyvinyl chloride plant at Barry enjoyed a substantial scale of production during the past year, despite the general contraction in demand for plastic materials, and the quality of the range of products now being marketed by the Geon company has enabled us steadily to increase our sales both in the home market and for export.

Reference has been made previously to our investments in industrial undertakings overseas, particularly in South Africa and Australia. I am glad to say that our trading operations in these countries are showing very satisfactory results, and we have under constant review the broadening of our activities to enable our company to participate in the growing demand for industrial chemicals, which it is felt will arise from the general development of those countries.

Your company is still maintaining an extensive research programme, which stockholders will recognise is an essential background to the large-scale developments in which we are engaged.

The company has not yet benefited from the anticipated reasonable return from expenditure on the major part of the expansion scheme, and it may be some time before it does, but it should be remembered that it will be necessary to continue, over an extended period, the board's established policy of ploughing back a substantial part of the profit earned therefrom.

In announcing the proposal with regard to the alteration in the capital structure, the board deemed it advisable, therefore, to issue a statement that it must not be assumed there would be an increase in the amount paid out by way of dividend.

It is satisfactory to note, however, that so far as the current year has progressed, the profits earned by the company are well up to the standard of the year to March 31, 1949.

It is again a pleasure for me to be able to pay tribute to the services of our staff. Relations with both works and office staffs continue to be excellent, and the board's appreciation has again been translated into the form of a small monetary bonus, 7½ per cent having been paid for the year to March 31, 1949, as against 5 per cent for the previous year.

In intimating a repetition of the 7½ per cent rate for the current year, it was made clear that this is not to be looked upon in any way as a permanent addition to either wage or salary.

In other words, when times are good and conditions justify it, the board is only too glad to consider rewarding loyalty and devotion in some practical manner. If, on the other hand, we were to run into a depression, with a consequent drop in profits, I feel sure we could count on the same loyalty and devotion even though no additional monetary reward was possible.

The report was adopted.

Next Week's Events

MONDAY, SEPTEMBER 26

British Ceramic Society

Birmingham: Assembly room, Chamber of Commerce, New Street, 2 p.m. Autumn meeting. E. V. Bland: "Some Experiences with Mechanical Transport in a Clay Works."

International Leather Industry Exhibition

Milan, Italy: Daily, until October 2.

British Rheologists' Club

Bristol: University. General conference and annual general meeting (until September 28). Opening session on Rheology of Solids introduced by the president, Prof. N. F. Mott.

Institution of Works Managers

Sheffield: Royal Victoria Station Hotel, 7 p.m. Annual general meeting (Sheffield branch).

TUESDAY, SEPTEMBER 27

Radiolympia, National Radio Exhibition

London: Olympia. Daily. until October 8.

Institution of Works Managers

Leicester: Bell Hotel, 7 p.m. Discussion. J. Ayres: "The Works Manager," (Leicester branch.)

Liverpool: Reece's Restaurant, Parker Street, 6.30 p.m. Annual general meeting and supper. (Merseyside branch.)

WEDNESDAY, SEPTEMBER 28

Society of Chemical Industry

London: William Beveridge Hall, The Senate House, University of London. The Food Group: A Symposium on Amino acids and Protein hydrolysates. Opening address by Prof. E. C. Dodds, followed by papers and discussions. (Until September 30.)

International Motor Exhibition

London: Earls Court. Daily, until October 8.

National Smoke Abatement Society

Harrogate: Lounge Hall, Royal Baths. Wednesday, 3.30 p.m. Presidential address, Lord Simon of Wythenshawe; 4 p.m. Annual general meeting; 8.30 p.m. Reception by Mayor of Harrogate. (September 29-October 1, annual conference: papers, discussions and visits, etc.)

Society of Chemical Industry

London: Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. Members of the Plastics and Polymer Group invited by the Plastics Institute to attend a lecture by Mr. Gordon Russell on "Industrial Design and Plastics."

THURSDAY, SEPTEMBER 29

Sir John Cass Technical Institute

London: Jewry Street, Aldgate, E.C.3. 6 p.m. Eric Walker: "Industrial Law," first of a series of 12 lectures.

Royal Statistical Society

Sheffield: The University, St. George's Square. 6.30 p.m. Twenty-sixth meeting of the group. D. R. G. Davies: "The Application of Statistical Methods in American Steel Plants."

FRIDAY, SEPTEMBER 30

Royal Statistical Society

Birmingham: Chamber of Commerce, New Street. 6.30 p.m. Twenty-ninth meeting of the group. Dr. J. Rodgers (chairman): "Statistics as an Aid to Productivity."

Industrial Chemistry Congress

AT the 22nd International Industrial Chemistry Congress, to be held at Barcelona, Spain, from October 23-30 important papers to be presented and discussed include. "Copolymerisation," by Prof. Manuel Lora Tamayo, vice-rector of the Central University, Barcelona; "Development of a Great Medicament—The Application of Penicillin," by M. H. Pénau, former president of the Spanish Academy of Pharmacy; "Delayed Action of Penicillin," by M. M. Janob, professor of the faculty of pharmacy of Parish University; "Spanish Petrol Economics," by S. Exc. Don. Demetrio Carceller, former director-general of the Compañia Española de Petroleos, S.A.; "New Trends in Industrial Chemical Equipment," by Dr. E. H. T. Hoblyn (secretary, BCPMA); "The Rôle of Chemistry in the Vaporisation of Combustibles," by Prof. C. Padovani, director of the Combustibles Experimental Station, Milan, Italy.

Numerous prizes are to be awarded for the best paper presented at the congress, the best paper on chemical engineering and equipment, the best work relating to spectro-photometric dosage of vitamin A.

Prices of British Chemical Products

Further Fluctuation in Lead Chemical Values

ALMOST all sections of the industrial chemicals market have been active during the past week with home consumers showing more interest in new contract business. Export inquiry has expanded particularly from the hard currency countries and the immediate outlook as far as export demand is concerned is reassuring. Higher non-ferrous metal prices anticipated as a result of the suspension of metal sales from midnight on September 17 until September 22 and following the devaluation of sterling were expected to affect the prices of the chemical compounds. No information, however, was available at the time of this report. To what extent the Coal Tar products market would benefit by the more favourable exchange rate remains to be seen.

MANCHESTER.—Home-trade buying on the Manchester chemical market during the past week has been fairly active and deliveries of the alkalis and other heavy products are going forward steadily to the textile and allied industries and to the other consuming outlets. The devaluation of the pound is expected to be reflected in the prices of certain imported chemicals, though it is early yet to say what the actual effects will be. A fair trade is passing in some of the fertiliser materials, with the demand for the tar products variable, though most of the light distillates are being taken up in fair quantities.

GLASGOW.—Business in general in the Scottish heavy chemical market remains fairly quiet. A greater tendency has been observed for price inquiries for local business and for export the market in general has been very quiet.

Price Changes

Rises: Caustic soda, pyridine.

Reductions: Arsenic, cobalt oxide, cresylic acid, toluol.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.— Ton lots, d/d, £101 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £36, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder. Spot, 35/37%, £11 to £11 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £46; in 1-cwt. bags, commercial, granulated, £27; powdered, £30; extra fine powder, £31; B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £48; crystals, £53; powdered, £51-£53; extra fine powder, £53. B.P., crystals, £61; powder, £62; extra fine, £64.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6d. per lb. (Nominal.)

Copper Chloride.—(53 per cent), d/d, 1s. 9d. per lb. (Nominal.)

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb. (Nominal.)

Copper Nitrate.—(53 per cent), d/d, 1s. 7d. per lb. (Nominal.)

Copper Sulphate.—£36 5s. per ton f.o.b., less 2%, in 2-cwt. bags. (Nominal.)

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £94. (Nominal.)

Lead, Red.—Basic prices per ton: Genuine dry red lead, £105 10s.; orange lead, £117 10s. Ground in oil: red, £129 5s. orange, £141 5s. Ready-mixed lead paint: red, lots of 20 gals. and under 160 gals. in 1 gal. tins uncrated, £2 5s. per gal.; orange 3s. 6d. per gal. extra over the price for red. (Nominal.)

Lead, White.—Dry English, in 8-cwt. casks, £115 10s. per ton. Ground in oil, English, under two tons, £135 10s. (Nominal.)

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£103 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500). ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

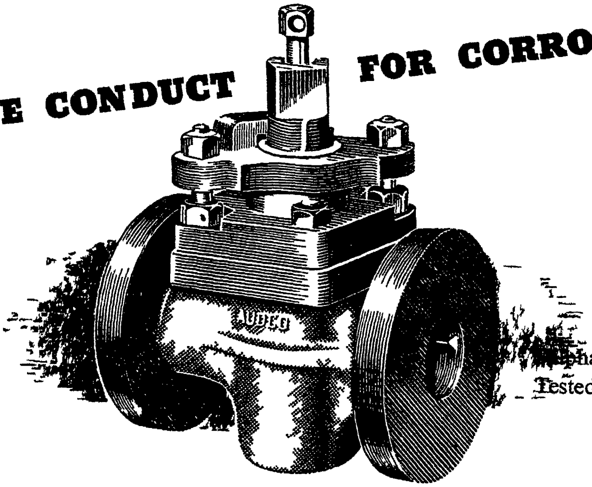
Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

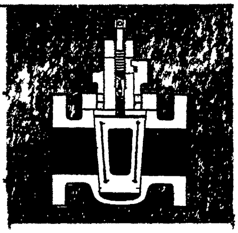
Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

SAFE CONDUCT FOR CORROSIVE FLUIDS



[illegible]phate Resisting Type S R.
Tested to 100 lbs /□″ Air

For the safe and efficient handling of corrosive fluids, Audco valves are made in a wide range of corrosion-resisting materials, specially designed to meet the many and varied requirements of the Chemical Industry.



Sectional elevation of Audco Screwed Valve with plug in closed position

AUDCO *Lubricated* **VALVES**

DIRT CAN'T GET IN—FLUID CAN'T GET OUT

Audco's patented lubricating and plug-seating features ensure positive sealing, certain and easy operation, and low maintenance The seats are always sealed by lubricant, ensuring rapid and positive closure when required

Audley Engineering Co. Ltd., Newport, Shropshire

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £66.; green seal, £65; red seal, £63 10s. (Nominal.)

Zinc Sulphate.—£31 per ton. (Nominal.)

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached. £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in October, £10 0s. 6d., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 11s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2 raised from £10 8s. 6d. to £10 18s. per ton, due to increase in potash content, as notified in new Board of Trade Order.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d. per gal.; 99%, 3s. 1d.: 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: September 21. Unrefined, per ton, naked ex works, linseed oil £126, foots £76; castor oil, first £98, second £91: rapeseed oil (Chinese) £130, rapeseed oil (other) £140. The prices of all other unrefined oils and fats remain unchanged. There is no change in the prices of refined oils until November 5.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Stiffening Resistance

NEARLY a year has passed since the nationalisation of the chemical industry, or of Imperial Chemical Industries, Ltd., was being talked of in Socialist circles as a firm objective to be achieved sooner or later—and preferably soon. Much has happened since to make that proposal even more objectionable than it appeared to responsible opinion twelve months ago. Workers' discontent, poor performance and rising costs in some of the industries upon which the problematical benefits of State control have been conferred must inevitably have weighed heavily in inducing second thoughts in those who endeavour to control the course of official Socialist Party policy. Had they not, it is unlikely that the proposal which came to life with prospects apparently no less attractive than those which culminated in the Iron and Steel Bill would have received so little regard when the Labour Party conference discussed Socialist planning earlier this year. Little was said then about the attractions of a State chemical industry, but several other industries were named as the next in the list to become national concerns—among them the independent sugar refineries.

The similarity between sugar refining and some of the basic sections of chemical production is self evident. They share some of the same needs in fundamental equipment, their labour requirements differ only in the numbers involved and their products are prime essentials. According to the hasty political judgment, British sugar refining is "a monopoly." That was a phrase familiar no long ago in some of the propaganda brought to bear on chemical industry. That the implication it was intended to convey was equally misleading in both cases is another familiar element of similarity.

Those are some of the factors which permit a close analogy to be drawn between these two examples of doctrinaire policy, of which one is still being pursued, while the other—chemicals—is possibly pigeon-holed. None of its first supporters, one may be certain, considers it has been abandoned. In the two cases there has been, however, one very conspicuous difference which richly deserves to be emphasised, because in it is the first heartening evidence that the principle of making sure the public knows all the facts of what it is proposed to do in their name is to be given the scope it deserves. To take in charge the chemical, steel, insurance or sugar industries and make them a possible charge on every payer of direct or indirect taxation (since

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what are ostensibly assets commonly are revealed as liabilities under nationalisation) is conspiciously a matter of public interest. Yet in the instance of steel, and of chemicals when the latter industry was tentatively named, the public heard little or nothing of all the very good reasons why the Labour Party proposals should not be permitted to proceed to a deplorable finale for everybody concerned, despite the fact that such an end was clearly forseen by all who were fully acquainted with the facts.

The sugar industry is fortunate in having found in its largest group, Tate and Lyle, Ltd., and Lord Lyle of Westbourne, the sugar company's president, a leadership which has had no hesitation in appealing directly to the public, telling them all the facts about the sugar industry, the brief history of the "snap decision" to make a State enterprise of sugar and the most probable outcome if that policy is allowed to materialise. On behalf of the management of Tate and Lyle, Ltd., Lord Lyle recently offered to stockholders, and others in London, the most forthright and penetrating survey ever given of what is involved in implementing such a scheme as is now proposed.

So much is written and spoken about the merits of "putting all the cards on the table," while the dealer witholds half the pack; the Tate and Lyle statement brings renewed hope that from now on the public will in fact be told the full truth, without reservations, whenever it is again proposed to take vital industries out of the hands of the people fully qualified to operate them at a profit. Lord Lyle said he was intent on making the management's position clear to stockholders and, so wide has been the publicity given to it, his statement was in fact addressed to the country at large. "We intend," he said, "to carry on until the day comes when the planners and their public relations officers file into our offices and start organising production with minutes and memoranda. Our methods of personal contact and intimate knowledge of men and machines will be outmoded, and on that day each one of us will say a reluctant goodbye to the men with whom we have worked so long. Many of us will back our faith in free enterprise and start again."

As a statement of faith and as the first determined attempt to reveal in terms which all can comprehend what

(continued on page 444)

Notes and Comments

Dollars and Metals

THE optimism which has strangely characterised recent Government statements on the probable effects of declaring the £ to be worth $2.80 is unlikely to prove infectious, particularly in those quarters which have had good cause this week to study the effect, not of another penny on the loaf, but of increases of a very different order in the prices of many essential materials, notably non-ferrous metals and compounds and some imported chemical materials. The news given this week of the immediate reaction of copper, lead, zinc, tin and the precious metals, among which platinum for chemists and scientific instrument makers is raised immediately from £18 to £24 10s. per oz., will make necessary new production costing throughout a range of chemical and associated industries much wider than the primary purchasers of these metals. That alone is certain. What will be the ultimate result of the profound disturbance of balance between prime costs and the saleability of products in the hard currency markets is a forecast which few outside the Government would be willing to attempt at this stage. The recent advances of copper and lead by over £32 per ton, of zinc by about £20 and tin to the unprecedented level of £750 and upwards may conceivably be compensated by easier conditions in the dollar markets which, it should be noted, most competitor countries, however, will share. At home, where no such compensation can exist, a marked inflation of prices becomes inevitable.

Chemical Factors

THE case being urged for devaluation as a powerful aid to sales in the dollar markets—of the U.S.A. rather than Canada, which has itself adopted a protective measure of devaluation—can have very much less force for chemical manufacturers than it is expected to have for the direct export industries. To suppose that, even with the aid of a 30 per cent price reduction, British industrial chemicals can supplant North American productions in their own markets is merely fanciful, although certain accustomed coal chemical exports may well benefit. There remain the facts that the whole value of chemical sales to the U.S.A. in August was £60,400 which is approximately 1 per cent of this country's entire receipts for chemical sales to the world that month, while chemical imports from the U.S.A. for the same period cost £333,521. These are the considerations which will urgently confront many chemical manufacturers in the approaching months. There has been no evidence so far that the authorities at the Board of Trade have any proposals to set against the possibility that a steep price rise in an essential such as U.S. sulphur may seriously inflate the materials costs of the multiplicity of users of sulphuric acid.

Industrial Relations

IT is not without significance that the art-cum-science of procuring honest and satisfying team work in any large group of workers—which was the subject of acute and revealing contributions at the opening session of the Oil and Colour Chemists in London last week—hides behind a host of aliases. The subject, whose vital importance to all large groups in chemical industry is reflected in ways being rapidly multiplied—house organs, staff associations and consultations with apparently very successful results also suffers from the continual disability that the *bona fides* of any practical application in the works are usually suspect at first, regardless of the purity of the motives of those responsible. Absolute honesty and goodwill are the essentials—as the Colour Chemists' discussions did well to emphasise—and management must conspicuously display their virtues before any corresponding return can be expected from others. It bears emphasising over again that what has been achieved in chemical industry, often in despite of conditions which provide workers with little scope for a sense of individual responsibility or personal achievement, bears comparison with anything attained in more favoured trades. How great is the need that the effective principles underlying these happy associations should take root in wider spheres is proved by the reference to the sort of events which currently make up much of the news of industry. The rôle of the chemist himself, fortunately not a matter of national importance, forms a much more complicated problem. While he usually seeks no benefit from the newer forms of the sharing principle, he is prone—as speakers in London readily recognised—to be regarded, unfairly, as " a back-room boy " unsuited to make a significant contribution in leadership or liaison. That belief is almost certainly a myth—but only chemists themselves can prove it is.

STIFFENING RESISTANCE

(*continued from page 442*)

unreflecting appropriation by the State of some vital activities may produce, the Tate and Lyle report deserves to be filed for widespread reference. Its context is in fact much wider than the sugar refining industry and many may tacitly have applauded the resolution passed unanimously by members of the sugar company in London. It deserves to be put on record: " Believing as we do that nothing but harm to workers, consumers, and stockholders alike can spring from the nationalisation of the sugar refining industry, the members of this company hereby empower the board of directors to do everything in their power to meet the threats of the nationalisers who, learning nothing from the chaos, losses, and labour unrest that they have created in other industries, now wish to seize the assets of the company."

Chemistry in the Air

AIR passengers marooned in B.E.A. waiting rooms may beguile their vigil by reading the official notices. Chemists will derive much amusement from one which begins " The Carriage of any of the following Articles by Air is Forbidden " (Form No. BEA—T 186, to be precise). This tells one, for example, that no acids may be carried except citric and tartaric (alginic acid is presumably ruled out). One returns to the beginning and passes " carbon bi-sulphide " with a frown, and is arrested by the headings " chlorate of potassium (potash), chlorate of sodium (soda)." They are being extra careful, it seems. "*Eau oxygenée,*" the only heading in French, may have something to do with a preference for brunettes. Matches (" Lucifer percussion of all kinds ") caters, supposedly, for those getting on in years who may respond to these old-fashioned terms. With natrium peroxide no synonym is given; it is followed by nitrate of soda—this time not sodium (soda) as with the chlorate. The hyphen in nitro-glycerine may be there in the interests of clarity, but " nitro of lime calcium " is fabulous. The company will not carry saltpetre or arrack, and is probably particularly down on those wishing to despatch meal worms by plane. The imagination is stimulated by this notice, but chemists may wonder when their simple and orderly nomenclature will be adopted officially in Britain.

Schoolboy Politics

THE prominence of Sir Stafford Cripps in the news recalls a schoolboy " howler " which is included in the second revised edition of " The Best Howlers," compiled by Cecil Hunt and published by Ernest Benn, Ltd., last week (price 6s.).

The Chancellor of the Exchequer is described thus: " Sir Stafford Cripps is a lawyer who has been in labour ever since he entered politics."

AID FOR RESEARCH

I.C.I. to Give £12,000 to Pakistan

THE Pakistan Association for the Cultivation of Science has accepted an offer from Imperial Chemical Industries, Ltd., to provide 160,000 rupees (£12,000) for research fellowships in chemistry, physics and biology at Pakistan universities or institutions, over a period of five to seven years. Each fellowship will be worth about 400 rupees per month, and will be for two years, with a possibility of extension to three. In addition, fellowship holders would be given a grant to cover expenses for special apparatus and materials.

The Pakistan Association for the Cultivation of Science, will make appointments and control the fellowships, which will not distinguish between sexes, race, or religion; the overriding consideration will be scientific fitness for research.

In furtherance of its policy of encouraging fundamental research wherever facilities exist, I.C.I. has, since 1944, provided £48,000 a year for research fellowships at the universities of Birmingham, Cambridge, Durham, Edinburgh, Glasgow, Liverpool, London, Manchester and Oxford. The University of Leeds was added to the list in 1945 with an annual grant of £4800. In July this year a grant of £2500 per annum was made to St. Andrews University for the purpose of establishing a Hall of Residence for graduates and undergratuates engaged on research.

I.C.I. also makes grants of money to the chemical departments of universities for the purchase of chemicals and apparatus for research work, at a cost of about £25,000 per annum.

New Cheshire Oil Mill

THE foundation stone of a new oil mill at Bromborough, Cheshire, was laid recently for the British Extracting Company, a subsidiary of Lever Bros. and Unilever, Ltd. It is expected that it will be ready for operation towards the end of next year.

When completed, the mill will provide employment for about 120, excluding the clerical and administrative staffs and will be capable of producing more than 30,000 tons of oil annually from vegetable oil seeds, such as groundnuts.

The seeds will be unshipped directly into dockside tanks connected with the new mill, where they will be processed to afford principally soaps and margarine.

GERMAN TRADE BID

U.S. Forecasts

THE view that economic necessity will force Germany to make a strong bid for a share of the world chemical business was expressed recently in the U.S.A.

The chemical industry was a potential source of dollars to Western Germany, declared Major General John Hildring, U.S.A. (retired), in an address to a meeting of the Synthetic Organic Chemical Manufacturers' Association.

The speaker, who has been a foreign trade consultant since 1947 and was formerly assistant Secretary of State in charge of policy in Germany and other occupied areas, said that he was convinced that the new German Government would make as a minimal concession to its bid for re-election such financial adjustments as were necessary to get German chemical products moving in foreign trade.

The 30 cent mark, absence of subsidies, the United States tariff, and high mark production costs were cited by the speaker as the reasons why American producers had not yet felt the change in the German markets.

Returning from a two-months' trip, during which he visited the principal European chemical centres, Dr. Emil Ott, director of research for the Hercules Powder Co., Wilmington, Delaware, stated that he believed the German chemical industry was back on its feet, though he did not think the country would again lead the world in volume production of chemicals.

The U.S.A. had acquired world leadership in chemicals during the last war, declared the chemist, but Germany was proving an important supplier of special chemicals.

Record Steel Output

THE annual rate of steel production this year reached the record figure of 14,953,000 tons for the month of August, compared with the previous best rate of 14,117,000 tons in the same month in 1948.

Although production reached a record level last year, details issued by the British Iron and Steel Federation show that every month's output in 1949 has so far exceeded that of the corresponding month in 1948.

Pig iron production in August was at an annual rate of 9,477,000 tons, compared with 9,048,000 tons in August, 1948.

The standing record rate for steel output was reached last May with 16,409,000 tons.

NOXIOUS GASES

Proposed Changes of Legislation

A DRAFT order extending the list of noxious or offensive gases mentioned in the Alkali, etc., Works and Regulation Act, 1906, has now been prepared by the Minister of Health.

After a public inquiry and consultation with the local authorities and other interests concerned, under the powers conferred by the Public Health (Smoke Abatement) Act, 1926, it is proposed by the Minister that the following amendments be made.

The expression "noxious or offensive gas" in the Alkali, etc., Works Regulation Act, 1906(c), shall include (in addition to the gases or fumes already specified) volatile organic sulphur compounds; fumes containing carbonaceous particles from black production works; fluorine.

The descriptions in the first schedule to the Act of 1906 shall be extended so as to include the additional working shown in italic below:—

Sulphuric acid works—*or by any other process involving the use of oxides of nitrogen*; chemical manure works—*and works for the granulating of chemical manures*; bisulphite works—*and works (not being smelting works as defined in section 8, sub-section (1) of the Act of 1906 or other works defined elsewhere in this schedule) in which oxides of sulphur are evolved in any chemical manufacturing process*; cement production works—*and works in which cement clinker is ground or cement is packed.*

It is proposed that the list of works mentioned in the first schedule to the Act of 1906 shall be extended to include the undermentioned additional works:—

"Black production works, that is to say, works in which carbonaceous blacks are manufactured by the cracking or incomplete combustion of hydrocarbons, coal tar, petroleum or their derivatives.

"Fluorine works, that is to say, works in which fluorine or its compounds with other halogens are made or used in any manufacturing process.

"Acid sludge works, that is to say, works in which acid sludge produced in the refining of coal tar, petroleum or other hydrocarbon derivatives is treated in such manner as to cause the evolution of any noxious or offensive gas."

The public inquiry into the subject matter of the draft Order will be held by

(*continued at foot of next column*)

RIC AUTUMN PROGRAMME

"Careers for Chemists"

DETAILS of the autumn session of the Royal Institute of Chemistry (London and South-Eastern Counties Section) show the wide range of subjects to be covered in papers and discussions.

Among the joint meetings arranged are "Plastics and Corrosion" by H. Barron at the County Technical College, Dartford, with the SCI (October 17); "Chemotherapy and Essential Trace Elements" by Prof. A. Albert, with the Cambridge University Chemical Society (October 28); "Leather: Its Constitution and Properties," by M. P. Balfe, with the Welwyn Garden City Scientists' Club (November 22).

Following the success of last year's meetings for senior children and students, a further series has been arranged during the autumn and spring. Under the title "Careers for Chemists," the first two of these meetings will be held at the technical colleges at Brighton (November 3) and Norwood (November 8).

The annual general meeting will be held at the Royal Society of Medicine, London, on November 16, and the dinner-dance at the Connaught Rooms, London, on November 18.

INDIA LIMITS IMPORTS

ATTENTION is drawn by the Board of Trade to the belated publication in New Delhi of text implementing the new import licensing policy of the Indian Government for the current shipping period (July-December), which will have the effect of excluding a wide range of imports. Special licences may be issued in respect of certain categories, as in the case of goods covered by irrevocable letters of credit valid beyond September 15. Instruments, such as Wheatstone bridges, potentiometers, pyrometers and thermocouples are among the group for which licences will not ordinarily be issued. Other large categories will be subject to a quota based on past imports or to licensing only if they are shown to be essential. Subject to the former provision are a wide range of industrial and pharmaceutical chemicals. The schedules are reproduced in the *Board of Trade Journal* (2753, 600).

Mr. W. A. Damon, chief inspector under the Alkali, etc., Works Act, at the Ministry of Health, Caxton House East, Tothill Street, London, S.W.1, on Tuesday, October 18, at 2.30 p.m. Any interested person may attend.

MITIGATING THE SMOKE NUISANCE

Case for Restricting Use of Bituminous Coals

THE importance and wide range of the work of the Fuel Research Station of the Department of Scientific and Industrial Research, were described by its director, Dr. A. Parker, at the conference of the National Smoke Abatement Society, held at Harrogate this week.

Dr. Parker observed that advances in the measurement of atmospheric pollution, now under the guidance of a committee of the Fuel Research Board, had been made through work carried out at the station, and there were now over 500 instruments in use in many parts of the country. With these, local authorities were making daily and monthly observations of deposited solid matter, pollution by smoke and sulphur and the intensity of daylight.

Dr. Parker recalled that the war work of the station had included the fitting of over 1000 merchant ships with a simple new device for preventing smoke emission from ships in convoy, the development of mobile gas producers for vehicles, flamethrowers, the production of hydrogen for barrage balloons, and research on the recovery of sulphur from pyrites to facilitate the manufacture of sulphuric acid.

The complete abandonment of the use of raw bituminous coal, or, alternatively, the licensing of its sale and use for approved purposes only, as being essential for the successful mitigation of the smoke nuisance, was the drastic course recommended by several speakers.

Ending Domestic Smoke

"In the battle against the old-fashioned open coal fire burning bituminous coal, victory is at last in sight," said Lord Simon of Wythenshawe, in his presidential address. Research and development in the production of more efficient heating appliances, the necessity to conserve fuel, and the more enlightened attitude of Government departments were reasons for confidence in the belief that in 30 years' time there would be no more domestic smoke.

With progress in the industrial sphere, said Lord Simon, there should also be the end of any serious emission of smoke from factories within that time, "so that we may look forward with reasonable confidence to the end of the smoke nuisance as a whole within 30 years."

Mr. Arnold Marsh, general secretary of the NSAS, opening the discussion on the reports presented by the representatives of the various regional smoke abatement committees, said that smoke control legislation in this country was 75 years out of date. It was based on the Public Health Act of 1875 and could be described as stable-door law. Nothing could be done to stop smoke until after it had been emitted. What was wanted now were powers to control the conditions that could result in smoke. Means to this end were the prior approval of all new fuel-burning plant, smokeless zones, and, as in the U.S.A., licensing the sale and use of bituminous coal for approved purposes only.

Smoke Means Waste

It was not only clean air we wanted, said Mr. Marsh, important though that was for health and because of the costly waste it involved. Smoke to-day, wherever it came from, was the visible sign of fuel being wasted and of production costs higher than they need be.

"As a rule, domestic smoke has a greater adhesive power than factory smoke because of its greater tar content; the effect of domestic smoke is proportionately greater in winter, and it may be confidently stated that domestic smoke is more pernicious in its attack upon human and vegetable life," stated Mr. Eric Sinkinson, lecturer in fuel technology at the University of Leeds. "Thus the combined effect of the two kinds of smoke in large centres of population is very disastrous."

Bituminous raw coal was really all we were offered readily for our fires, said Mr. Sinkinson, and if we burned it in closed-in stoves with greater efficiency than in open grates we created vicious black smoke. Only by completely abandoning raw bituminous coal for domestic use could we hope to mitigate the smoke nuisance and avoid the losses and waste by so doing.

Coal Output

Total coal production in Britain last week was 1800 tons less than in the previous week. Strikes are stated to have caused a loss in output of 55,400 tons. Comparative figures are:—Last week: 4,235,100 tons (deep-mined 3,960,400 tons, opencast 274,700 tons). Previous week: 4,236,900 tons (deep-mined 3,962,900 tons, opencast 274,000 tons).

TREND OF CHEMICAL EXPORTS

Further Shrinkage in August Totals

EXPORTS of chemicals from the United Kingdom in August once again reflected the general decline in overseas trading, and although there were increases in some commodities as against July, there was a general decrease compared with August, 1948.

Total value of exports for the month shown in the *Trade and Navigation Accounts of the United Kingdom* for August 1949 (H.M.S.O. 6s. 6d.) was £6,594,864 (£7,021,087), composed as follows: chemical manufactures and products (other than drugs and medicines) £3,317,883 (£4,145,129); drugs and medicines £1,521,733 (£1,239,109); dyes and dyestuffs £867.242 (£568.574); paints and pigments £888,006 (£1,068,275).

Despite a decline in the last two months, total exports for the first eight months of this year were valued at £57,565,484, an increase of £2,866,870 over the same period of 1948.

Representative totals are as follows:—

CHEMICAL EXPORTS

	Aug., 1949	Aug., 1948
	Cwt.	Cwt.
Formic acid	2,648	2,454
	Lb.	Lb.
Salicylic acid and salicylates ...	180,466	248,815
Value of all other sorts of acid ...	£90,658	£72,879
	Tons	Tons
Aluminium oxide	26	234
Sulphate of alumina	3,390	4,243
All other sorts of aluminium compounds	525	276
Ammonium sulphate	15,707	17,109
Ammonium nitrate	1,740	14,096
All other sorts of ammonium compounds	1,336	1,912
	Cwt.	Cwt.
Bleaching powder	8,373	51,288
All other bleaching materials ...	10,299	7,856
	Gal.	Gal.
Cresylic acid	107,833	212,567
Tar oil, creosote oil, anthracene oil, etc.	1,017,935	2,471,276
Value of all other sorts of tar oil ...	£46,714	£56,369
	Cwt.	Cwt.
Collodion cotton	1,920	1,213
	Tons	Tons
Copper sulphate	2,442	887
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	43,652	40,749
	Tons	Tons
Fertilisers	1,072	1,553
	Cwt.	Cwt.
Nickel salts	5,779	2,456
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	4,981	9,751
	Gal.	Gal.
Tetra-ethyl lead	76,436	110,256
	Tons	Tons
Magnesium compounds	601	756
	Gal.	Gal.
Methyl alcohol	8,260	7,463
	Cwt.	Cwt.
Potassium compounds	6,033	7,115
	Tons	Tons
Salt	21,053	19,310
	Cwt.	Cwt.
Sodium carbonate	170,453	452,803
Caustic soda	187,467	227,549
Sodium silicate	15,008	11,608
Sodium sulphate	47,783	85,769
All other sodium compounds ...	78,116	96,070
Cream of tartar	528	350
Tin oxide	656	888
	Tons	Tons
Zinc oxide	991	1,100
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,317,883	£4,145,129
	Oz.	Oz.
Quinine and quinine salts ...	186,159	159,629
	Lb.	Lb.
Acetyl-salicylic acid	63,594	111,760
	100 International Units	100 International Units
Insulin	2,199,070	424,038
	Mega Units	Mega Units
Penicillin	697,546	424,457
Total value of drugs, medicines and preparations	£1,521,733	£1,239,109
Total value of dyes and dyestuffs ...	£821,241	£530,411
	Cwt.	Cwt.
Plastic materials	37,330	31,697
Value	£456,497	£414,281
	Cwt.	Cwt.
Chemical glassware	1,086	1,191
Value	£52,462	£40,759
	Cwt.	Tons
Fans	3,786	161
Value	£101,365	£106,230
	Cwt.	Tons
Furnace plant	3,742	223
Value	£58,847	£56,848
	Cwt.	Tons
Gas and chemical machinery ...	26,350	808
Value	£273,257	£150,656

CHEMICAL IMPORTS

	Aug., 1949	Aug., 1948
	Cwt.	Cwt.
Acetic anhydride	4,805	7,921
Acetone	—	5,827
Acetic acid	—	23,332
Boric acid	6,400	2,200
All other sorts of acid	4,440	4,569
Borax	24,001	3,600
Coal tar products (excluding benzol and cresylic acid) ...	5	651
Cobalt oxides	625	136
	Tons	Tons
Fertilisers	205	266
Glycol ethers and glycol ether-esters	96,609	750,094
Iodine	—	132,100
	Cwt.	Cwt.
Potassium chloride	674,788	813,530
Potassium sulphate	32,560	10,340
All other potassium compounds ...	5,235	4,024
Sodium nitrate	39,880	39,881
		Tons
Sulphur	—	44,002
All other sodium compounds ...	11,155	3,865
Carbon blacks (from natural gas)	32,044	68,927
Total value of chemicals, drugs, dyes and colours	£1,566,361	£2,672,007

25 OCT 1949

The Netherlands Salt Industry

The Water-Injection Method of Recovery

by JOHN GRINDROD, B.A.,(Com.)

THE first salt factory of the Royal Dutch Salt Industry (N.V. Koninklijke Nederlandsche Zoutindustrie) is situated at Boekelo, surrounded by woods and heather, in the province of Overijsel, about 15 km. from the German frontier station of Gronau.

The second and more modern works is near Hengelo on the Twente-Rhine Canal. The winning of salt in the Netherlands does not depend upon the underground cutting of rock salt. The great depth of the seams, some of them 300-400 metres below ground level, makes this method far too costly.

The Dutch industry is based on the method of injecting water into the seams and forcing the resultant brine to the surface. This, too, is comparatively costly, but refined salt is produced in one operation, by evaporation

Supplementing the production of refined salt, there has grown up a related chemical industry, making caustic soda, carbonate of soda, sulphate of soda, nitrate of soda, chlorine and derivatives, etc.

Refined Salt Exports

While raw salt is imported into the Netherlands from Portugal for industrial purposes such as fish preserving, a good deal of the refined Dutch product is consumed abroad.

Salt is, of course, present in solution in all sea waters and those of certain lakes. The North Sea contains 2 to 3 per cent of salt. The Mediterranean contains 4 per cent or more. Where evaporation becomes more and more extreme, as in the Dead Sea, saturation point of about 300 gr. of salt per litre of water is reached. If concentration still continues, the salt crystallises and is deposited on the floor of the sea to form, in time, a bed of salt. In the course of centuries such beds may be hundreds of metres thick and, becoming part of the earth's crust, may sink to a depth of up to 1000 metres. Under the enormous weight which then covers this saline strata the salt becomes compressed, moisture escapes and rock salt results.

Such a bed of rock salt was found accidentally, both at Boekelo and Hengelo in the Netherlands, at a depth of 325 to 400 metres.

(continued overleaf)

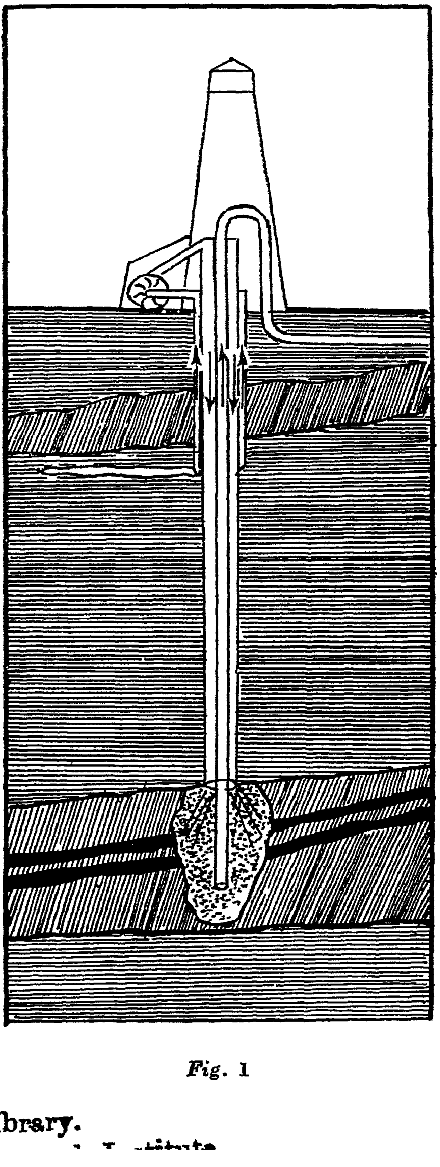


Fig. 1

Linlithgow Library.

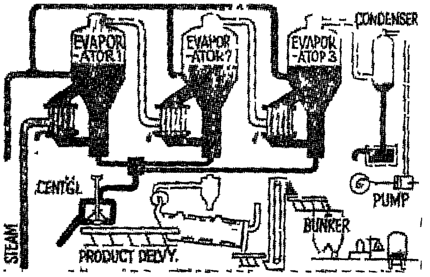


Fig. 2

The bed at Overijsel was discovered during a search for water in 1885, but the owner of the land concealed the fact, fearing the conversion of his countryside into a mining and industrial centre. The existence of the salt finally came to the knowledge of M. J. P. Vis, who was associated with the firm of Kolff and Vis M. Vis, and who conceived the idea of making Holland independent of imported salt.

Soundings were made at Eibergen, but were abandoned in 1903 after reaching a depth of 751 metres. A second sounding was precluded by the operation of a law passed in 1903 by virtue of which mineral research became exclusively vested in the State for 20 years.

In 1909 State prospectors made furthur drillings and salt was found near Winterswijk and near Buurse. The earlier private prospectors applied for the concessions to work both places, but as coal had also been disclosed under the bed of salt at Winterswijk, the Government would consider granting a concession only for the Buurse drilling. After some compromise this was granted in 1918. An exploitation agreement was then drawn up between the Government and the "Royal Netherlands Salt Industry."

Further soundings were taken, a factory was erected and a year later the first refined salt was produced. The following table shows the results of the first drilling of the K.N.Z.

Other drillings were found to be almost similar.

The raw product of K.N.Z. is the ‘ Röt ” salt belonging to the Trias of the secondary geological epoch. The salt revealed by the borings of the Society of Mining Works, near Groenlo (concession Gelria) and by the State prospectors near Winterswijk belong to the Permian of the first geological epoch. It is probable that, under the Röt salt in the concession Buurse, there might also be found, at about 1000 m. depth, a Permian salt, and still further down again coal.

The concession Buurse is so rich in salt that there is enough to last for 80 years, even if exploitation reached 25 million tons per year—roughly the entire world consumption of salt for all purposes. This, moreover, is only one of several salt regions.

These successful borings have been partly percussion drilling with a chisel and partly rotatory drilling with a diamond crown. Using the latter method, as soon as the drill reaches the bed of salt a steel tube is lowered as far as the upper side of the salt bed. (Fig. 1.) This tube is hermetically sealed in the rock. A thinner tube is then introduced into the first and is projected to the bottom of the salt bed. Water pumped down the exterior tube comes into contact with the rock salt, forms a saline solution and is forced to the surface through the interior pipe. Thence it is conveyed by pressure in an iron conduit of 2½ km. to the factory where it is received in gauged reservoirs. The salt content of the brine is established and excise duty is paid on the quantity thus determined.

From the gauged reservoirs the brine is transferred to refining tanks where noxious matter is eliminated by chemical action. The brine is then put into vacuum apparatus which is then sealed.

In three sealed pans, the brine is freed from water by evaporation. After having been transferred mechanically from the pans to centrifuges the salt is dried to

(*continued overleaf*)

Depth (in metres)	Thickness (in metres)	Beds found	
0.0 — 7.7	7.7	Yellow and grey sand	Diluvian
7.7 — 63.7	56 0	Heavy green and grey clay accompanied by sand and having underneath a large content of sand and water.	Tertiary
63.7 — 86.3	22.6	Shell marble.	Trias
86.3—324.95	238.65	Mixed red and grey sandstone alternating with beds of shale containing clay and with anhydrite.	
324 95—327.9	2.95	Impure rock salt (1st bed)	
327.9 —332.5	4.6	Anhydrite	
332.5 —354	21.5	Impure rock salt (2nd bed)	
354.0 —355.36	1.36	Red and grey shale with anhydrite	
355.36—358.45	3.09	Impure rock salt (3rd bed)	
358.45—359.9	1.45	Anhydrite.	
359.9 —400.4	40.50	Rock salt (4th bed of salt)	Trias
400.4 —401.1	0.70	Anhydrite	
401.1		Old variegated sandstone	

Italian Experience with Methane

Its Use in Thermo-Electric and other Plants

A SUMMARISED report of the proceedings of the 4th National Methane Congress, Padua, Italy, held this summer, has been published (*La Ricerca Scientif.*, *19* (7), 727-731). Some fifty papers were presented in five sections: direct and indirect research, compression and transport, geology, industrial uses, and production. Brief reference was made in the first to the Eltran and Matran methods of electro-magnetic conduction described in the paper by Prof. Arnaldo Belluigi.

The principal subject of interest in connection with transport was corrosion, on which several papers were read, including one by Bernard Heuzé of the Société d'Etudes sur la Corrosion, of Paris, and others by Italian engineers. Fifteen papers covered the industrial uses field. G. Bosinelli, director of the Communal Gas Works of Padua, dealt with the domestic use of methane, from which it appears that a mixture of coal gas and methane has proved very satisfactory. F. A. Choffel (U.S.A.) discussed problems of methane compressors, and on the basis of considerable American experience stated that it has been found that the new type of combined compressors are more economical in use.

Prof. C. Codegone, director of the Technical Physics Institute, Turin, read a paper on methane compression, illustrating the laws of iso-entropic compression, and recording some results with mixtures of varying methane content. Other papers in his section dealt with the use of methane in Italian transport, *e.g.*, by the FF.SS. on the Rovigo-Chioggia, etc., line.

Prof. M. Medici described results so far obtained with thermo-electric plants run on methane, using turbines, on either open, closed or semi-closed circuits. In another paper—by Ing. G. Minucci, technical director of the Soc. Idrocarburi Naz. di Firenze (Florence)—some interesting cost figures for actual running were given for turbine plants up to 2000 kW.

Ing. F. Parisini, of Bologna, illustrated different types of valve for high pressure methane containers. Prof. G. Pastonesi dealt with the subject of hydrogen manufacture from methane, but his data was mainly foreign rather than Italian. No details are given in the summary.

Other papers in the section related to the use of methane as fuel in agricultural tractors, and with various combinations of methane with other sources of fuel in the design of power stations (Ing. S. Sestini, of the Soc. Pignone, of Florence). Several papers on power methane included those of Prof. I. Tessari (Trieste University); Ing. L. Varriale, of the Ansaldo firm, Genoa; Ing. Gh. D'Ambrosio, of Cisa-Viscosa; M. Zancanaro, of Soc. Impianti Idrotermici, of Padua; and Ing. G. Pavani, of the Dalmine metallurgical works.

Visits by delegates were paid to the works of Cisa-Viscosa, Padua gasworks, and other factories in the neighbourhood. A methane exhibition was also organised.

On the important subject of production and Italian reserves of natural gas, the raconteur does not say much in his summary, beyond mentioning the names of a few authors who were largely concerned with professional training in this field.

THE NETHERLANDS SALT INDUSTRY

(*continued from previous page*)

contain no more than 3 per cent moisture. It is then dried by contact with warm air until it contains less than 0.1 per cent moisture. All this is done mechanically. (Fig. 2.)

To distinguish between ground rock salt and refined salt it is sufficient to examine them both by magnifying glass. Refined salt is composed of regularly formed crystals while the rock salt has no regular crystal pattern.

If a little salt produced is dissolved in water the crushed salt is also found to contain 1 to 2 per cent of insoluble substances. The refined salt produces a clear solution and contains 99.4 per cent Na Cl.

From an output of 25,000 tons in 1920, the total production of K.N.Z. in 1947 was increased to 240,000 tons. Production in 1948 was approximately 247,500 tons, about 20 per cent over the pre-war output.

At the original Boekelo works an artificial sea water swimming pool with artificially maintained salt content and a wave generating appliance has been built.

The more recent works in the Twente-Rhine canal are within reach of coasting vessels, providing cheap transport for the refined product.

NEW META ALKYL PHENOLS

Cashew Nutshell as a Source of Varied Derivatives

From A CORRESPONDENT

THE main constituents of cashew nutshell liquid are phenolic in nature and contain a high proportion of monohydric meta-substituted phenol, a proprietary form of which is known as Cardanol and is used for making synthetic resins. A new development is the hydrogenation of the liquid to produce two meta alkyl phenols, the 3-pentadecyl phenol and 5-pentadecyl resorcinol. The former compound can be obtained in a yield of approximately 45 per cent of the cashew nutshell liquid, while the 5-pentadecyl resorcinol is produced in a yield of approximately 5 per cent.

Solvents and Special Resins

Some of the uses for these products include conversion to oil additives, anti-oxidants for petroleum fuels, and mutual solvents for the rotenone-containing resins with petroleum hydrocarbons, these solutions being used for insecticidal purposes. Interesting new heat-reactive resins can be made by a one-stage process from these phenols.

The 3-pentadecyl phenol is a waxy solid, pale amber in colour. It has a melting point of 49°-51° C. and a boiling range of 190°-195° C. at 1 mm. mercury. This phenol is insoluble in water and aqueous alkalis but is very soluble in organic solvents, including aliphatic hydrocarbons.

The 3-pentadecyl phenol forms heat-reactive resins with an equi-molecular amount of formaldehyde and using either acid or alkaline catalysts. These one-stage resins while in the fusible stage are readily soluble in hydrocarbons, including the aliphatic, such as naphtha or mineral spirits. They are being examined for use as coating resins.

Hydrogenated Cardanol sulphonates very easily when heated with concentrated sulphuric acid at 125° C. (preferably under vacuum). When complete water solubility is reached, after about two hours, the hot mixture is poured into heptane, the solution heated for complete solution, and then cooled to cause crystallisation of the sulphuric acid which is recovered by filtration.

The sulphonated product is readily soluble in water and is soluble in all the organic solvents except the aliphatic hydrocarbons (cold). The sodium and potassium sulphonates are practically insoluble in water but are soluble in a wide range of solvents. These sulphonates are suggested as additives for dry-cleaning fluids.

Interesting nitro compounds are obtained from 3-pentadecyl phenol by treatment of a solution of hydrogenated Cardanol in chloroform with fuming nitric acid. Both 4-nitro and the 6-nitro-3-pentadecyl phenols are obtained, the first named having a melting point of 71.5°-72° C. and the 6-nitro compound a m.p. of 43°-44° C. A tri-nitro derivative can be prepared by utilising the disulphonic acid. These three nitro compounds are soluble in practically all the common organic solvents, with the exception of cold aliphatic hydrocarbons for the 4-nitro phenol and of the lower aliphatic alcohols for the 6-nitro compound.

The most important amino derivative is the 4-amino-3-pentadecyl phenol made by reducing the nitro derivatives with hydrogen and Raney nickel catalyst in ethyl acetate solution. The pure 4-amino compound has a m.p. of 105.5°-106.5° C., while the pure 6-amino phenol has a m.p. of 133°-134° C.

The Irvington Varnish and Insulator Co., of New Jersey, U.S.A., reports that the 4-amino-3-pentadecyl phenol is likely to assume considerable importance as a gum inhibitor in petrol.

Wax Uses

The lower alkyl ethers of 3-pentadecyl phenol are low melting solids, the higher alkyl ethers (up to octyl) are liquids, and the higher alkyl ethers, such as lauryl and stearyl, are solids of increasing melting point. An interesting waxy ether, unaffected by boiling alkalis, is prepared by combining 2 moles of anhydrous sodium salt of hydrogenated Cardanol with 1 mole of 1, 4-dichlorbutene.

This wax has a m.p. of 71°-73° C. and is insoluble in the lower alcohols but soluble in hydrocarbons. It is possible that this waxy ether may be of interest for improving the alkali resistance of wax preparations for treating floors, polishing car bodies, and finishing leather.

The 5-pentadecyl resorcinol is a waxy solid having an iron or greyish white colour. Its molecular weight is 320, its melting point 91°-93° C., and its boiling range is 220°-225° C. at 1 mm. mercury.

VERSATILITY OF DICYANDIAMIDE

Many New Industrial Uses

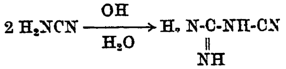
From A CORRESPONDENT

ONE of the most versatile of new nitrogen chemicals is dicyandiamide or cyanoguanidine. Although first prepared in 1851 by Cloez and Cannizzaro, it was not until 1858 that its properties were studied by Beilstein and Geuther. Until the last fifteen years this chemical has been mainly of academic interest, but to-day it is being produced in bulk for use as an intermediate in the manufacture of plastics, drugs, starch products, dyestuffs, and textile chemicals, for case-hardening steel, fireproofing paints, etc.

Dicyandiamide, $H_2N(HN)CNHCN$, is prepared commercially by the dimerisation of cyanamide in the presence of bases (Osborne, U.S. Patent 2,416,542-5, 1947). Cyanamide, H_2NCN, a colourless soluble crystalline substance (m.p. 40° C.) is itself made by heating calcium carbide in nitrogen at very high temperatures.

$$CaC_2 + N_3 \xrightarrow[\text{arc}]{\text{electric}} CaNCN - C.$$

$$CaNCN + CO_2 + H_2O \longrightarrow CaCO_3 - H_2NCN$$



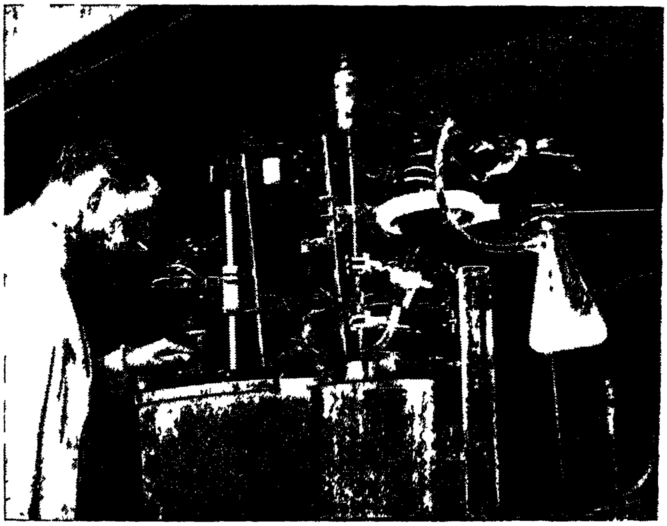
$$2\,H_2NCN \xrightarrow[H_2O]{OH} H_2N\text{-}\underset{\underset{NH}{\|}}{C}\text{-}NH\text{-}CN$$

The dimer, dicyandiamide, is a colourless, crystalline solid with a melting point of 209° C. (decomposition temperature) and a density of 1.404-1.405 at 14° C. It is a non-volatile substance and freely soluble in water, ethyl and methyl alcohols. Dicyandiamide reacts with acids, both organic (in non-aqueous media) or inorganic (in very concentrated aqueous solutions) to precipitate the salt. These salts are practically completely hydrolysed in aqueous solution. The dimer is an amphoteric compound and reacts with alkalis as well as acids; with the alkali and alkaline earth hydroxides it forms salts.

In 1834 the famous chemist Justus von Liebig synthesised melamine, but it was not until over a hundred years later that this triamide of cyanuric acid assumed any importance. To-day melamine, which is made by the pyrolysis of dicyandiamide or reaction with ammonia and amines at high temperature, finds uses in many fields, particularly synthetic resins, coatings, tanning agents, ion exchange resins for water purification, etc.

Pyrolysis can give a 50 per cent yield

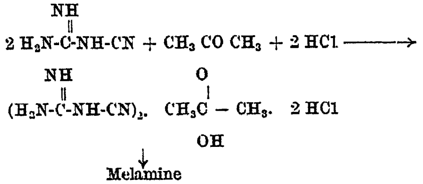
(continued overleaf)



Depicting one of the stages in the Glaxo Laboratories during the manufacture of "thyroxine," active chemical of the thyroid gland, which has now been prepared by synthesis on a commercial scale. L-thyroxine-sodium Glaxo, which is the pure crystalline hormone presented in accurate dosage by weight, 1 mg., representing the thyroxine content of about 1 gr. of thyroid BP. The preparation is capable of having important effects in accurate treatment of thyroid deficiency of melamine (2,4,6-triamino-1,3,5-triazine), but better yields can be obtained by use of anhydrous solvents; liquid ammonia and ethanolamines have been recommended. When dicyandiamide is heated under pressure with amines, substituted melamines along with some melamine can be obtained (Keller and Korten, U.S. Patent 2,222,350, 1940).

Melamine Synthesis

MacLean (U.S. Patent 2,402,061, 1946) developed a method of making melamine at low temperature and without the use of pressure by reacting dicyandiamide with acetone and hydrochloric acid for 2-3 hours at 15°-30° C. to form a complex which on treatment with alkali at room temperature gives melamine.



$$2\,H_2N\text{-}\overset{\overset{NH}{\|}}{C}\text{-}NH\text{-}CN + CH_3\,CO\,CH_3 + 2\,HCl \longrightarrow$$

$$(H_2N\text{-}\overset{\overset{NH}{\|}}{C}\text{-}NH\text{-}CN)_2.\ \ CH_3\overset{\overset{O}{|}}{C} - \underset{OH}{CH_3}.\ \ 2\,HCl$$

$$\downarrow$$

Melamine

Barbituric acid or malonyl urea is now being produced from dicyandiamide, which is also the starting point for the synthesis of a number of guanidine salts; *e.g.*, guanidine nitrate has been prepared in over 90 per cent yields on a commercial scale by reacting the dimer and ammonium nitrate in liquid ammonia at 160°-165° C. under pressure. This method has been described by Paden, Martin and Swain, *Ind. Eng. Chem.*, 39,952 (1947).

Quantitative yields of aryl biguanide salts are obtained by reacting dicyandiamide with an aromatic amine and an equivalent amount of mineral acid in water at 75°-100° C. (Curd and Rose, British Patent 581,346, 1946). A recent British patent (Jacobs and Jolles, 587,907, 1947) covers the production of aryl biguanide salts by refluxing the dimer with an aromatic amine and an inorganic acid, in an anhydrous medium such as a tertiary amine.

Biguanide

Quantitative yields of alkyl guanidine salts can be obtained by fusing aliphatic amine salts with dicyandiamide at 180° C. for three hours (Phillippi and Marsh Ber. 60B, 2120, 1927, and Merner and Bell, J.Chem.Soc. 1922, 1790). High yields of biguanide can be obtained by reacting dicyandiamide with ammonia and an equivalent amount of copper sulphate, the pure biguanide being obtained by treating the copper compound with hydrogen sulphide and subsequent treatment with alkali to afford biguanide and sodium sulphate.

By condensing dicyandiamide with disubstituted malonic acids, it is possible to produce the cyanimino pyrimidines. When these are alkylated they can be hydrolised to N-mono-alykl-5, 5-disubstituted barbituric acids. Taub and Kopper took out a patent in 1933 (German patent 590,175) to cover this synthesis.

In the production of starch adhesives this nitrogen compound is being used for modifying physical properties. Adhesives made from converted starch products show high tackiness and wet grab when treated with dicyandiamide. Another fairly recent application of the dimer is as a thinner for oil well drilling muds. It has also found some use as a stabiliser in alkyl aryl sulphonate soaps to prevent deposition of solids at high temperature.

Patented Uses

There are now many patents covering new uses of dicyandiamide. Several of these disclose the application of the halogenated compounds for disinfecting, cleaning and sterilising purposes. Muskat and Chenicek (U.S. Patent 2,299,069, 1942, and U.S. Patent 2,184,888, 1939) first prepared mono and polyhalogenated dicyandiamide. It is considered that the halogen probably replaces the hydrogen in the amino or imino-nitrogen as the products contain "active" or positive halogen, up to 87 per cent active halogen being present.

The American Cyanamid Company has taken a prominent part in the development of dicyandiamide as an industrial chemical and a number of key patents have been taken out in their name. Some of these suggest uses in many unrelated fields, such as the manufacture of soldering flux; rubber chemicals; additive to shellac for moulded insulators; development accelerator in photography; stabiliser or inhibitor for nitrocellulose; manufacture of vinyl vinylidene chloride co-polymers; explosives, and for processing fats and soaps.

In its commercial form dicyandiamide has a purity of about 99 per cent, with moisture content 0.2 per cent and insoluble matter not more than 0.1 per cent insoluble in water. The compound is stable when dry and in neutral solutions up to temperatures of 80° C. Aqueous solutions may be held at 150° C. for short intervals.

Golden Jubilee

More than 3500 employees and their families attended the 50th birthday celebrations of the Leathercloth Division of I.C.I., Ltd., at Walker Lane sports ground, Hyde, Cheshire, on September 24.

WORLD OIL PRODUCTION

First Decline Since the War

AFTER a period of unparalleled expansion during recent years, world production of crude oil declined in the first half of the current year—the first decline since the end of the war, states the *Petroleum Press Service*. It can be estimated from figures already available that world supply will have amounted to about 232 million tons, or 6 per cent less than the all-time peak reached in the second half of 1948. However, the figure for the first half of this year (in metric tons) was still substantially higher than that for the same period of last year.

U.S. Reduction

Output continued to increase in many countries, though at a slower rate, and the decline in world production is accounted for by a fall of over 11 per cent in the U.S.A.—the world's leading producer—from 143,693,000 tons in the second half of last year to 127,656,000 in the first half of this year and 133,497,000 tons in the first half of 1948.

The U.S.A. share in the world total thus dropped to 55 per cent, against 60 per cent and more for a number of years. This decline reflects a sharp curtailment of production, which reduced demand and congestion of stocks made necessary. Since Venezuela depends on the U.S. market for an outlet for her crude oil, the decline in the U.S.A. enforced a lower output in Venezuela, the world's second largest producer, from 36,011,000 to 31,998,000 tons.

U.S.S.R. Supplies "Disappointing"

Petroleum output in the Soviet Union is officially stated to have risen by 10 per cent in the first quarter of this year and by 12 per cent in the second quarter, compared with the same quarters of 1948. It is admitted that supplies remain disappointing when contrasted with the country's quickly expanding requirements. There is indeed little prospect of attaining the target of 35.4 million tons during the current year which the Russian authorities some time ago considered essential.

It is interesting to note that the combined ouput of the Middle Eastern countries (excluding Egypt) rose from 25,425,000 tons in the first half of 1948 and 32,040,000 tons in the second half of last year to 35,103,000 tons in the half-year under review, thus, for the first time, surpassing, by over 3 million tons. Venezuela's output. The general rate of expansion, however, has been slowed, even in this prolific and expanding area, chiefly because of marketing difficulties in the Eastern Hemisphere. Iran is still the largest producer in this area and there was a further, though smaller, increase in the output of Saudi Arabia. Production in Kuweit, however, leapt from 4,327,000 tons in the second half of 1948 to 6,162,000 in the first six months of this year. Kuweit is thus the sixth largest oil producer.

Operations in Iraq are still hampered by the closure of the pipeline to Haifa. Developments in Egypt have been influenced favourably by the discovery of oil in the Sinai Peninsula.

Mexico continues to suffer from the lack of capital and technical assistance. The slight gain in the second half of last year has not been fully maintained this year, but her official spokesmen remain optimistic about the future. Her output in the first half of this year was 4,150,000 tons.

Progress in Indonesia

Further progress was made in the reconstruction of the older Indonesian oilfields and new fields were opened up in Dutch New Guinea. If the growing output of British Borneo (1,660,000 against 1,570,000 tons) is taken into account, the combined yield of the archipelago is already well in excess of its pre-war rate of over 8 million tons a year.

The expected " new era " in Rumania's oil production has not materialised; indeed, output, estimated at 2,070,000 tons, was substantially lower than the figures for the second and the first half of 1948.

South American Recovery

Most of the smaller South American producers have been moderately successful this year. Colombia made headway after the setback through strikes in the earlier part of 1948. The older Argentinian fields are giving smaller returns, but the Y.P.F. is endeavouring to balance this by new discoveries. The slow upward trend in Peru, which started in 1947, is continuing. Prospecting in Ecuador has not as yet affected output. Minor increases have been registered both in Bolivia and in Brazil.

CONTINUED GROWTH OF S. AFRICAN CHEMICALS

Large Production of Fertilisers Begins

THE new African Explosives and Chemical Industries plant at Umbogintwini began production this month, yielding more than 1000 tons of superphosphates a day. Work on the £1 million extension is almost complete. Part of the new machinery is working, and it is probable that the major portion of the plant, with an annual capacity of 410,000 tons of superphosphate, will be in production before the end of the month. The production target is five times the 1939 output. This will be one of the largest phosphate units in the world, and certainly the largest in Africa. According to the *Monthly Bulletin of Statistics*, during the 1946-47 financial year the output of private fertiliser works in the Union rose from £4,027,145 to £4,165,656. Only 40 per cent of the materials used in these factories was derived from local sources.

* * *

The other significant current development by AECI is the erection of a plant to produce a further 26,000 tons of ammonia, equivalent to 21,400 tons of nitrogen. This tonnage should meet in full the current requirements of the Union, both for agricultural and industrial purposes. Potash, the third essential element of plant food, will still have to be imported. The manufacture of nitrocellulose lacquers has just begun at Somerset, West, 30 miles from Cape Town, where the plant has been planned on a scale sufficient to meet all the Union needs in such lacquers.

* * *

The Cape Chamber of Industries believes that new import exchange quotas for the first half of next year may be issued in November. It does not expect that manufacturers' allocations will be bigger than they are for the current half-year. The Director of Imports and Exports has informed the Association of Chambers of Commerce that quotas and import permits for the non-sterling area may be transferred to the sterling area, provided that the directorate's permission is obtained in each case.

* * *

The New York Ore Trading Corporation recently completed an agreement under which it will take the entire manganese output obtained by the National Mining and Exploration Co. (Pty.), Ltd., and by its subsidiary, Western Manganese (Pty.), Ltd., at Posmasberg. It is estimated that there are millions of tons of high-grade manganese, representing a potentially important dollar earner for the Union. The American corporation has invested a large amount of capital in the development of these South African deposits and also sent out an expert to develop and mechanise the operations.

* * *

A recommendation for the remission of the Customs duty, of 2d. per lb., on fish and shark livers and marine oil-bearing tissues has been made by the Board of Trade and Industries. This recognises the claims recently advanced by the processers—that 70 per cent of the extracted oil is normally sold to the British Ministry of food and that practically the whole of the balance goes to the same destination. They have been asked to increase supplies to supplement vitamin A resources in Britain and Europe. The firm principally concerned has explored other sources of supply and obtained supplies of livers and marine tissues from other African coasts. The duty bore heavily on the costs of production of vitamin oils, placing them at a disadvantage as compared with oversea producers. The industry has lately undergone important developments in technique and scale production and is recognised as an important supplier of the export market.

* * *

Dyeing and finishing, including "crease-resisting" facilities, said to be equal to overseas standards, are being offered to the textile trade by a Johannesburg firm of dyers, bleachers and finishers, which has installed further new plant, costing over £100,000, and opened new departments.

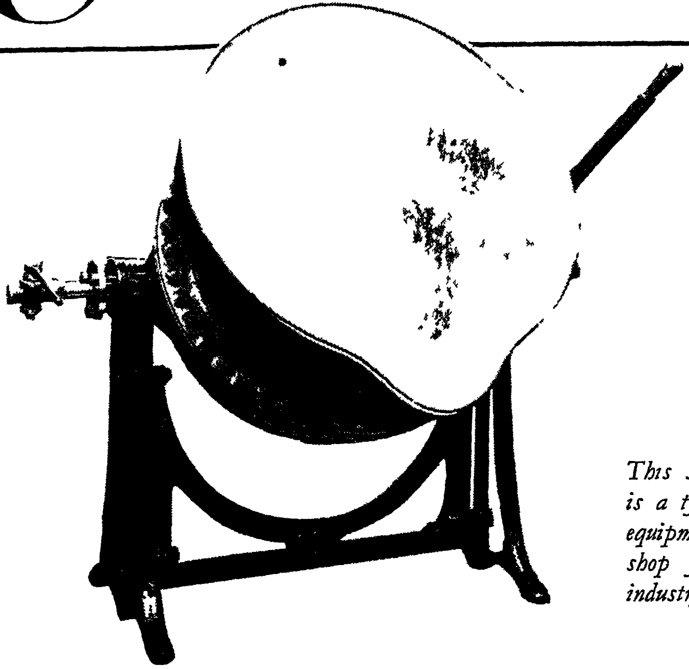
* * *

S.A. Pulp and Paper Industries, Ltd., Johannesburg, has begun the manufacture of ferric chloride, the compound for which engravers, printers, etc., have had previously to depend upon imports.

Metallurgical Section

Published the first Saturday in the month

Silver in Food Manufacture



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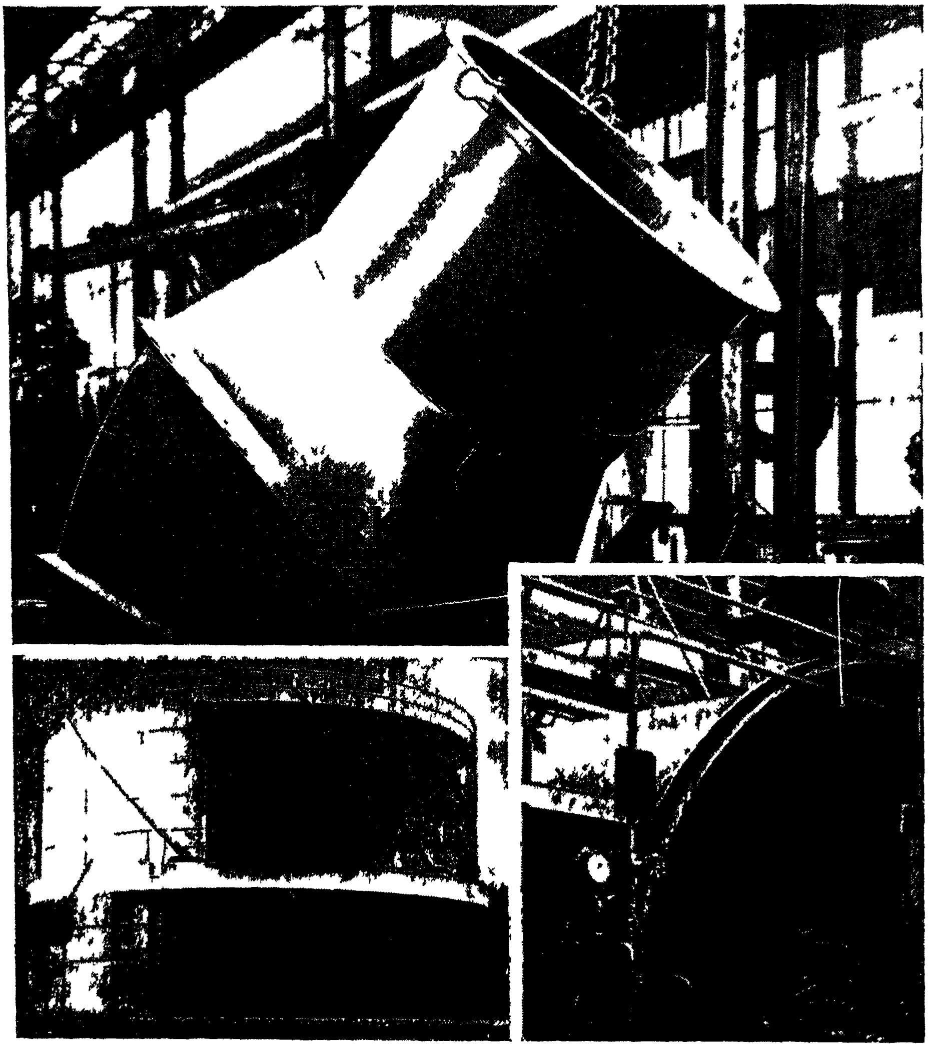

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Metallurgical Section

1 October 1949

STEEP ADVANCES IN METAL PRICES

Parity With the U.S.A. Still Sought

PURSUING its policy of endeavouring to maintain parity with U.S. base metal prices, despite the devaluation of the £ sterling, the Ministry of Supply announced last week new increased prices chargeable to domestic buyers. The new levels, which include freight and other charges, per ton delivered, are:—

Electrolytic copper £140 (£107 10s.).

Good soft pig lead £122 (£87 5s.).

Good ordinary brand zinc £87 10s. (£63 10s.).

Aluminium £112 (£93).

The Ministry has at the same time raised its buying price for rough copper to £110 per ton from £77 10s. per ton, the level ruling since July 28.

New selling prices for copper and lead, allowing for freights, are a little below dollar parity at the new rate. Zinc price corresponds with the current price of 10 cents per lb.

Government Tin Buying to End

Bulk purchase of tin by the Ministry of Supply is to end as soon as alternative arrangements can be made—states the Ministry. Meanwhile, the selling price of tin (99-99.75 per cent) in the United Kingdom is increased by £181 a ton to £750.

Levels, per ton, for other special grades in the U.K. are: Refined tin 99.75 per cent minimum, £757; refined tin 99.9 per cent minimum, in 28-lb. ingots, £760; grain bar tin, £770; granulated tin, £775.

It was announced at the beginning of this week that the price of platinum has been increased from approximately £18 to £24 10s. per oz.

The price of nickel was raised last week from £224 to £321 10s. per ton delivered U.K. works in order to bring the price into parity with the 40 cents per lb. price ruling in the U.S.A.

Ministry of Supply selling prices for imported copper rods and special shapes will be subject to additions per ton to the basis price per ton of copper as follows:—

	£	s.	d.
Black hot-rolled copper wire rods (not less than $\frac{1}{4}$ in. or more than $\frac{5}{16}$ in. in diameter)	14	0	0
High-conductivity electrolytic copper, tough pitch copper in the form of—			
(*a*) Vertically cast cakes:—			
(i) of not more than 800 lb. in weight and not less than 3 in. in thickness	2	10	0
(ii) of more than 800 lb. in weight but less than 1000 lb. in weight	2	17	6
(iii) of more than 1000 lb. but not more than 1500 lb. in weight	2	17	6
(iv) Deoxidised of 1000 lb. in weight	8	2	6
(v) Silver bearing of 300 lb. in weight ...	6 plus silver content	10	0
(vi) Silver bearing of 1000 lb. in weight ...	6 plus silver content	17	6
(vii) Oxygen-free high-conductivity of 300 lb. in weight	10	12	6
(*b*) Wire bars vertically cast:			
(i) Sizes from 155 lb. to 545 lb. in weight ...	2	10	0
(ii) Sizes from 750 lb. to 800 lb. in weight ...	3	5	0
(iii) Silver bearing of 275 lb. to 545 lb. in weight	6 plus silver content	10	0
(iv) Oxygen-free high-conductivity	9	7	6
(*c*) Billets of:			
(i) 3 in. or more but less than 4 in. in diameter	9	15	0
(ii) 4 in. or more but less than 7 in. in diameter	8	10	0
(iii) Phosphorised 3 in. in diameter	10	10	0
(iv) Phosphorised 4 in. and upwards in diameter, plain phosphorised or OFHC phosphorised, or plain OFHC	9	7	6
(v) 3 in. in diameter	10	10	0
(vi) 4 in. in diameter and over	9	7	6

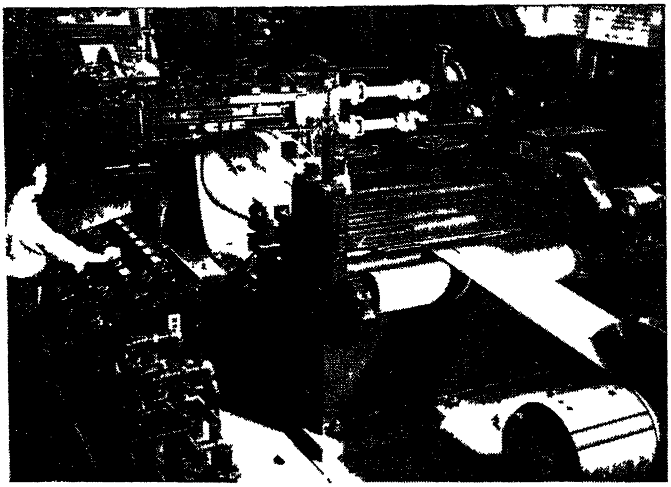
In addition to the new prices of non-ferrous metals, there is an increase in the selling price of Philippine refractory chrome. The new prices per ton, inclusive of carriage charges, are: direct *ex*-ship, £8 11s. 6d. (£8 5s.); *ex*-store, £9 8s. (£9 1s. 6d.).

Private Imports of Manilla Copal

The Board of Trade announces that all Government stocks of Manilla copal have now been sold, and traders are no longer required to take two tons of Government stock for each ton privately imported. Import licences continue to be issued by the Import Licensing Department.

U.S. Advance in Sheet and Strip Steel Processes

IN virtually every country capable of producing or acquiring the large and costly equipment, the post-war trend has been to provide means for a great increase in sheet and strip steels, which are in request by a continually widening range of fabricating industries. The latest response in the U.S.A. to that demand is the new sheet and strip mill lately put into production at the Midland, Pennsylvania, works of the Crucible Steel Company of America, two departments of which, showing the advanced high-speed principles, are depicted here. The whole cost the equivalent of £1 5 million (prior to devaluation).



The 54-in. multiple slitting line, part of the new Crucible equipment, includes an uncoiler, a leveller, a 60-in. shearing knife and (foreground) the rotary slitter, using four 15½-in. knives

Below: Flanked by gas-heated chambers for the steel rolls, this reversing mill hot finishes strip and sheet from 15 to 50-in. wide and, in about five movements, provides reductions ranging from 1 in. to .0076 in.

Separation of Arsenic and Antimony

Technical Methods in Several Countries

by WALTER WENDT, Dipl.Ing.

MARKETABLE antimony metal may not contain more than 0.3 per cent arsenic and the percentage of arsenic usually stipulated is 0.1. The lower the percentage of arsenic in the metal the more readily can the latter be sold. That explains the necessity of removing the arsenic most antimony ores contain in a greater or lesser degree.

> ***Antimony production in South Africa was comparatively insignificant as late as 1938, but by 1944 the Union had become the leading producer in the British Commonwealth and was third in the list of world producers. The sales value of South Africa's antimony production in 1947 was £322,045, and reserves are sufficient to meet demands for many years to come.—" Commonwealth Survey," No. 29***

Because of its importance, the problem of separating arsenic from antimony and its technical possibilities deserve close attention.

Several technical methods are known and some of them are in practical use.[1]

1. Differential flotation.
2. Removal of arsenic from metal by caustic soda.
3. Removal of arsenic from oxide and concentrate by volatilisation.
4. Elimination of arsenic in an electric filter plant.
5. Removal of arsenic from oxide by caustic soda.
6. Antimony refining by electrolysis.
7. Special processes

Differential Flotation

Low-grade antimony ores are enriched by flotation. These generally are the ores in which the percentage of arsenic is comparatively high. There are obvious advantages therefore in eliminating the arsenic by differential flotation immediately after mining the ore.

Putting this idea into execution the Antimónové banícke a hutnícke závody, úc. spol., Banská Bystrica, Slovensko, erected in 1931 a flotation plant for the selective flotation of gold bearing antimony ores, built by the firm Krupp Grusonwerk, Magdeburg.[2, 3, 4]

In this case the separation of arsenic pyrites, which contain the gold, from antimony trisulphide has to be carried out. At first, the flotation takes place in an alkaline medium using pine-oil and butylxanthate to obtain the arsenic-gold concentrate. Then the work is continued in acid pulp with creosote phosphate (*phosokresol*) and butylxanthate to obtain the antimony concentrate.

Chemical Agents

The amounts of required agents at the differential flotation applied to 1 ton of feed are as follows:—

220-300 g.	alkali
15-30 g.	pine oil
50-60 g.	*phosokresol*
140-350 g.	butylxanthate
6000-9000 g.	sulphuric acid

At a flotation feed of a minimum percentage of 7 per cent antimony in the form of sulphide and at least 11 g/t. gold as well as a maximum of 0.35 per cent arsenic the following guarantees were given by Krupp Grusonwerk:

a extraction of antimony concentrate with a minimum percentage of 60 per cent antimony, maximum percentage of arsenic 0.3 per cent.

b a yielding of 80 per cent of antimony contained in the flotation feed as antimony concentrate and gold concentrate.

c a yield of 75 per cent of the gold contained in the flotation feed containing in the antimony and gold concentrate.

d enrichment of the gold content in the gold concentrate with at least 200 g/t.

The average analyses of concentrates, derived over many years, were these:—

antimony concentrate		*gold concentrate*	
Sb	60%	Sb	15-20%
As	0.6%	As	8-14%
Au	25-40 g/t.	Au	200-250 g/t.
S	25%		
Pb	0.7%		

So it was possible to discharge the bulk of the arsenic in a separate concentrate. The so-called gold concentrate which contains most of the arsenic was at the same time enriched with gold. The antimony was enriched to 60 per cent.

Later, the differential flotation was abandoned and the ore was collectively floated, that is, as a mixed concentrate. This was not the result of a failure of the differential flotation but of technical considerations.

At Wiluna, in Western Australia, the differential flotation was also used for separation of antimony from arsenic- and iron-pyrites. But there at first a collective concentrate was treated and from this was separated an antimony concentrate of 60 per cent by depressing the arsenic- and iron-pyrites.

The separation of quicksilver, antimony and arsenic by differential flotation is studied by Tschumarov and Gontscharowa.[5] They show that sodium sulphide is an activator for arsenic pyrites, while it works as a depresser for antimony. Butylxanthate is used as a collector of arsenic in this case.

Removal from Metal by Caustic Soda

Working up collective concentrates as well as other products containing antimony by the roast-reduction process produces antimony containing impurities, chiefly arsenic.

The removal of arsenic is secured by smelting the antimony again in a refining furnace, treating it with caustic soda in an oxidised atmosphere.

A refining furnace of the type described here has proved effective.

The furnace is built of chamotte bricks with oil heating to provide quicker smelting. With a superficial bath area of 1 × 2 m., and a depth of 70 cm. the capacity is about 10 tons. Magnesite tiles are fitted where the walls of the bath come in contact with the caustic soda. To guarantee their durability the magnesite bricks must be well set, preferably with the use of sulphate of magnesia.

The process is this: After removing the iron by treating the molten metal with lump ore, the caustic soda is added to the bath in small lumps. The total amount of caustic soda in kg. required for a refining furnace of 10 tons capacity is determined by multiplying the percentage of arsenic in the antimony by 400. The total is added as 200 kg. quantities of caustic soda.

After the fusion of the first 200 kg., air is blown through the molten antimony bath by submerged tubes. This brings about full contact between the metal, caustic soda and air, and promotes oxidation. The resulting slag is removed and the next lot of 200 kg. caustic soda is added and the aeration is repeated. The completion of the removal of arsenic may be observed by the appearance of the slag but will be proved by analysis. A low percentage of arsenic results in a very thin liquid slag, so that in some cases clay has to be added to make the complete removal possible.

In this refining process a percentage of 0.1 of arsenic in the refined antimony is obtainable.

The slag holds 18 per cent of arsenic in the form of sodium arsenate and 13 per cent of antimony, as sodium antimonate.

This process of removal of arsenic from the metal has the disadvantage that the arsenic is not obtained until the last stage. This is undesirable in many ways and there are good grounds for striving to remove the arsenic during the production of oxide or immediately after. The literature gives some help.

Liddell[1] states that, after covering the molten antimony bath with soda ash, air is blown into the bath. In three successive operations, each of 2 hours' duration, the percentage of arsenic may be lowered from 1 per cent to 0.1 per cent. For each operation 2.5 per cent of the charge weight of soda-ash is required. The soda-ash in the resulting slag can be regenerated by a simple process.

The same author describes a further method of removing the arsenic by smelting broken-up metal with about 5 per cent of nitre and 5 per cent of soda-ash.

The method of oxidation of arsenic in a molten metal bath by blowing air into it in the presence of alkali is also treated by Merson, Krol and Krein[6] and regarded very favourably.

According to publications by the U.S. Bureau of Mines[7, 8], the percentage of arsenic was lowered from 2.22 per cent to 0.012 per cent in 15 minutes in a succession of experiments. They worked with a combination of equal parts of caustic soda, salt, nitre, and soda-ash using 35-40 per cent of the metal's weight of this mixture. Nitre or an oxidising agent of equal value is essential.

Removal by Volatilisation

Corresponding experiments on a large scale by the author to purify antimony oxide containing arsenic by volatilisation were performed in a round furnace. They did not lead to satisfying results.

Liddell[1] states that arsenic oxide volatilises when mixed oxide is heated above 200°C. in a muffle furnace, while antimony oxide remains either as antimony trioxide or as antimony tetroxide.

According to similar experiments performed by C. C. Chao in the laboratory of the National Bureau of Mining and Metallurgical Research, China, the percentage of arsenic was lowered from 2.38 per cent to 1.55 per cent at a temperature of about 300° C. By treatment of such arsenic containing antimony oxide with hot water and hydrochloric acid for 4 to 5 hours the percentage of arsenic is said to be reduced from 2.38 per cent to 0.54 per cent.

To shed light on the practice of removing arsenic from concentrate by roasting, the author experimented on a large scale. The result was a satisfying removal of arsenic by the fractional roasting of the concentrate in a rotary kiln at 500°C.

To the same end a series of roasting-experiments were carried out effected on a smaller scale by the Bureau of Mines.[7] A small iron revolving furnace with an electric resistance heating was used. During the roasting, air or steam was blown through the furnace. The experiments were performed at a temperature of 300°-600°C. They showed that below 500°C. little arsenic evaporated—to 13 per cent, at 500°C. 61.60 per cent arsenic and 23.88 per cent antimony evaporated. Above 500°C. the loss of antimony was too high—about 60 per cent. The use of steam instead of air at the favourable temperature of 500°C. is of great advantage.

This treatment gives a good elimination of arsenic—73.93 per cent—and the loss of antimony, 10.76 per cent, is not too high. In a further publication of the Bureau of Mines' treating with the same experiment, the arsenic elimination is stated to have been 88 per cent and the volatilising of antimony 10-15 per cent.

Hence it is possible to remove a considerable amount of arsenic by roasting the concentrate at 500°C., blowing steam through the furnace.

Recovery from Fumes and Gas

An electric filter plant could also be used for separating antimony oxide from arsenic oxide in the roasting fumes. The fumes obtained, for example, by roasting a collective concentrate in the oxide furnace are conducted without losses of heat in an electric filter plant. The antimony oxide, as dust in the fume, is precipitated, while the arsenic oxide, which is gaseous at this high temperature, goes through the electric filter plant and could be recovered in a bag filter after cooling.

Arsenic trioxide volatises without melting and begins to condense at 218°C. Antimony oxide has a smelting point of 656°C. and is stable between 360°-370°C.

This process was worked out when it was necessary to work up a concentrate with a low antimony percentage (35 per cent), a high arsenic percentage (8 per cent), and a suitable content of gold (30 g/t.).

The usual method of oxide production is based on the roasting of concentrates in the oxide furnace. This process was not practicable in this case because the smallest amount of antimony necessary, 40 per cent antimony content, was not reached.

In concentrates with such a high precentage of precious metals there are losses in the fumes of gold and silver. For this reason the turbulent process in the oxide furnace was replaced by roasting in the rotary kiln.

Recovery from Oxide

Experience with the rotary kiln showed that 60 per cent of the arsenic in the form of arsenic oxide volatilised, but only 25 per cent of antimony did so. The mixed oxide recovered in the filter chamber had a composition of 25 per cent arsenic and 40 per cent antimony. The oxidised material from the rotary kiln, containing the precious metals was treated in the blast furnace to recover gold and silver.

One of the basic problems was how to work up the mixed oxide. A material obtained by other processes in a comparable composition was reduced in a reverberatory furnace with a larger amount of soda-ash and charcoal. Under a cover of salt a yield with 13 per cent arsenic was produced.

Treating the mixed oxide with a hot solution of caustic soda leaves the antimony oxide unchanged and the arsenic oxide is converted into arsenite of soda. After filtration the arsenite of soda is treated with lime of chlorine in order to convert it into arsenate of calcium.

The fractional roasting of the concentrate in the rotary kiln at a lower temperature shows that the greater part of arsenic is volatilised with loss of only a small amount of antimony. Lixivation of the mixed oxide makes possible a total separation of arsenic from antimony. Antimony resting in the oxidised concentrate is by the following precious metal work necessary as collector.

In the most direct way, the ore is treated with a solvent and the solution electrolysed with an insoluble anode. Antimony and arsenic will be deposited together on the cathode.

In practice, the impure antimony metal obtained by a smelting operation is cast into anodes and these are electrolysed as soluble anodes, using a bath of sulphuric

(continued overleaf)

Copper-Chromium Oxide Catalysts

Trend of Recent Italian Research

RECENT work at the Institute of Industrial Chemistry, University of Padua (Italy), on the use of hydrogenation catalysts of copper-chromium oxide, has been described by A. Scipioni (*La Chim. et l'Ind.* 1949, *31*, 8, 277-280). Earlier work in this field, in the U.S.A., has been mainly that of H. Adkins, to which lengthy reference is made. Other contributions also are reviewed.

The present author has found that the usual treatment with acetic acid after thermal decomposition does not always have the desired effect of improved activity, unless barium, strontium, calcium, or magnesium are also present. These additions had already been proposed by Adkins.

But account must, of course, be taken of the particular mode of preparing the catalyst, of which several have been tried. No previous investigator appears to have studied the effect of varying the ratio $CuO:Cr_2O_3$, to which Scipioni now directs attention.

Tabulated results in the hydrogenation of furfurol, using catalysts of Cr_2O_3 content ranging from zero to 86 per cent, show that maximum activity is attained with chromium oxide content of 36.5 per cent, or roughly a ratio of copper to chromium oxide of between 4:1 and 3.5:1 (molar).

The effect of various factors, temperature, pressure, acidity, etc., is discussed. Pressures above 50 atmospheres are usually not necessary or helpful. The time required to reach the required autoclave conditions, e.g., temperature, after contacting catalyst and furfurol, varied according to conditions from 20 min. to 5 hrs. in one series of tests.

An important condition for maximum activity of catalyst is the absence of excess acidity or alkalinity, and therefore strict *p*H control is essential. For reducing acidity various proposals have been made, such as the use of calcium hydroxide; but according to tabulated results with several additives (alkaline) barium hydroxide appeared somewhat better than calcium hydroxide. NaOH was practically useless. The presence of water was found to be markedly effective in reducing activity, even when present in very small percentages.

SEPARATION OF ARSENIC AND ANTIMONY

(*continued from previous page*)

acid containing antimony fluoride in solution, and a small amount of free hydrofluoric acid. A separation of lead and precious metals from the antimony will be obtained, and arsenic deposits with the cathode metal. Arsenic must be separated from antimony either before the electrolytic deposition or after it, using a refining smelter process.

Experiments to refine gold-bearing antimony metal with differing amounts of arsenic by electrolytic methods, made by the Bureau of Mines[6, 10] showed that it is not possible to secure an antimony cathode free of arsenic. The electrolytic methods could not be used for the removal of arsenic.

In a Russian patent (57,555, A. A. Bagdassarjanz, D. J. Repkin and A. K. Schtockerbakow; 15.5.1938) impure antimony metal is refined by smelting the antimony ore with aluminium chips, treating the molten metal several times with NH_4Cl to remove arsenic.

The Russian patent (59,292, G. A. Mejersson, L. J. Krol, C. E. Krein and S. F. Ssolowjew; 16.11.1939) treats molten impure antimony metal at 850°-1050° C. with heated air at the rate of 0.2—0.6 litre/minute for each kg. metal, to drive off the impurities.[12]

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MODERN WELDING TECHNOLOGY

Application to Various Metals and their Alloys

A NUMBER of examples of the application of welding technique to a variety of metals and their alloys are given in reports appearing in the current issue of the "Welding Research" supplement to the transactions of the Institute of Welding.

One of these, on "Gas Welds in Aluminium-Magnesium Alloy Sheet," is presented by Mr. J. Pendleton, now with the Ministry of Supply and formerly investigator to the British Non-Ferrous Metals Research Association, in whose laboratories the work was carried out for the British Welding Research Association. In this report the wrought aluminium-magnesium alloys containing up to 7 per cent magnesium are stated to show promise as high strength weldable alloys, but have not been used to the extent which might be expected due to the development of internal porosity in the basis metal adjacent to a weld bead. The degree of such porosity increases with increasing magnesium content and decreasing welding speed.

The mechanism responsible for this porosity is reaction between the metal and water vapour forming atomic hydrogen, some of which diffuses into the metal to be rejected as molecular hydrogen at suitable interfaces. The extent of porosity is markedly affected by factors tending to increase the hydrogen content of the metal, notably the presence of minor impurities, calcium in particular.

With Magnesium Alloy

Laboratory-produced 7 per cent magnesium alloy sheet, of low calcium and hydrogen content, was welded without developing internal porosity, and the mechanical properties of the welds were consistently good, e.g., welding efficiencies ranged from virtually 100 per cent (16 s.w.g. sheet) to at least 80 per cent (10 s.w.g. sheet), tested with the excess weld metal machined away.

Cracking experienced in welds in an alloy of 2½ per cent magnesium was avoided by using filler rods containing 5 or 7 per cent magnesium.

Another report, on "An Evaluation of the Resistance Welding of Tin and Tin-Zinc Alloy Coated Mild Steel Sheet," by A. J. Hipperson and P. M. Teanby, was prepared as a result of experimental work done by the British Welding Research Association. sponsored by the Tin Research Institute.

Marked progress has lately been made in the U.S.A. in the use of welding in the employment of large diameter chrome pipe. A typical operation on 6-in. pipe is shown here

The application of resistance welding processes to the fabrication of light engineering assemblies is stated often to involve the problem of welding steel sheet which has previously been provided with thin electrolytically deposited metallic coatings. These coatings are intended either for protective purposes, or for the purpose of obtaining a good bond with paint which is subsequently applied, or both.

It has been found in the past that the presence of certain metallic coatings on the surface of mild steel sheet tends to impair its resistance weldability. The major difficulties introduced are twofold, *viz.*, contamination of the resistance welding electrodes with the coating material, and lack of contact resistance at the points were it is intended to produce resistance welds.

No difficulty was encountered in flash

welding any of the coated steels in the present work, and the properties of the butt joints were comparable with those obtained in uncoated sheet.

The production of spot welds in tin and tin-zinc alloy coated sheet was found to be quite practicable, but closer attention had to be given to the selection of welding machine settings and to electrode maintenance than is necessary with uncoated sheet. Tin-zinc alloy coatings were found to be better suited to spot welding than plain tin coatings.

With plain tin coating, electrode life was much shorter, and adhesion of the electrode tips to the surface of the stock presented some difficulty. The presence of zinc in the coating appeared to improve weldability considerably, compared with plain tin coating.

The use of fully automatic welding machines is desirable for welding coated steels, because the success which can be obtained with the process depends largely upon the use of accurately controlled machine settings.

Steel Company's Expansion

IT is announced by Dorman Long & Co., Ltd., that the second stage of its large-scale development plan, involving expenditure of £8 million, is to be put in hand at once. The company's projects include the handling of an open hearth steel plant at Lackenby with a capacity of 10,000 ingot tons a week, extension of its new ore grading plant at the Cleveland works, and the installation of new blast furnace ancillary equipment. It is hoped to complete this work in three years, and it is expected that about 60 per cent of it will be undertaken by the company's own engineering departments and by its subsidiaries.

The first part of the development scheme, costing £2.25 million, included the installation of central ore unloading equipment and ore preparation plant at the Cleveland works, and the construction of a private railway linking the Cleveland and Redcar works.

Mining Scholarships

The National Coal Board has published the names of 37 successful schoolboy candidates for university scholarships in mining engineering and allied subjects. Awards to 54 young miners, ranging in age from 17 to 33 years, were published several months ago. The value of the scholarships may be as much as £300 a year, depending upon the university attended.

HARD STAINLESS STEEL

Claims for New U.S. Process

BY a combination of extreme heat treatment and the deep-freeze principle an American company, the Robeson Cutlery Company, Perry, New York, claims to have overcome the comparative softness of stainless steel of the type used for cutlery and similar purposes. Knives made by the process are claimed to hold their keenness for three years and to be more resistant than conventional carbon steel.

Discussing the process, for which patent application has been made, Mr. Emerson E. Case, president of the company and originator of the method, states that tests and analyses so far indicate practically no difference in the composition or chemical characteristics of steel produced by the process and steel hardened by conventional methods. Tested on a standard Rockwell hardness testing machine, the new steel may show a hardness substantially the same as steel made by other processes.

Knife blades are first heated to a temperature much higher than that normally employed for this process. The blades are then bathed in quenching oil, according to the usual process, at a temperature of 104° F. Then they are placed in a specially-constructed deep freeze chamber at sub-zero temperatures.

After a suitable period of freezing, they are again heated, to relieve the usual stresses and strains. The blades are allowed to cool gradually to room temperature. Finally, they are tempered in the conventional manner to the desired degree of hardness.

Flintshire Lead Survey

NEW reserves of lead may be opened up by prospecting in progress at Halkyn, Flintshire. Operations at the Halkyn lead mine, one of the three largest in Britain, were suspended in 1941 because most of the ore was exhausted. Other veins are known to exist and a survey is to determine their extent. The Flintshire and Denbughshire lead mines have produced 650,000 tons of lead concentrates in the last 100 years, and until recently were third in the production table for the country. According to the Mineral Development Committee, "it is generally agreed that further development at Halkyn holds promise."

Britain's lead and zinc production has dropped from 40,000 tons a year in the 1930's to about 3,000 tons.

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Next Week's Events

MONDAY, OCTOBER 3

The Royal Institute of Chemistry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C., 6.30 p.m. (Joint meeting with SCI). J. Grant: "Pulp and Paper Manufacture as a Chemical Industry."

Institute of Metals

Paris: Maison de la Chimie, 28, Rue St. Dominique. 41st annual autumn meeting by invitation of the Société Français de Métallurgie and the French Non-Ferrous Metal Industries. Discussions, visits, etc. (until October 12).

TUESDAY, OCTOBER 4

Electrodepositors' Technical Society

Birmingham: Grand Hotel (morning) and James Watt Memorial Institute (afternoon). Symposium on "The Influence of the Surface Condition of Metals on Electrodeposits."

Incorporated Plant Engineers

Cardiff: Grand Hotel, 7.30 p.m. (South Wales Branch). "Pumping Machinery," by a representative of Pulsometer Engineering Co.

WEDNESDAY, OCTOBER 5

Institute of Packaging

Manchester: City Hall, Deansgate. 1st National Packaging Exhibition. Daily (until October 15.)

British Association of Chemists

London: Wellcome Research Institution, Euston Road, N.W.1, 7 p.m. Dr. A. H. Leckie (British Iron and Steel Research Association): "Some Aspects of Research on Iron and Steel Production Plant."

Society of Public Analysts and other Analytical Chemists

London: The Chemical Society, Burling House, Piccadilly, W.1, 6.45 p.m. J. Straub (Municipal Laboratory, Amsterdam): "Calculation of the Botanical Composition of Wheat Flours and Offals from the Chemical Analysis" and other papers by D. W. Kent-Jones, A. J. Amos, and W. Martin.

THURSDAY, OCTOBER 6

The Royal Institute of Chemistry

Dagenham: South-East Essex Technical College, Longbridge Road, 6.30 p.m. A. H. Charlton: "Modern Methods of Soap Manufacture."

Department of Scientific and Industrial Research

Glasgow: Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, C.2. 10.30 a.m. One-day conference on "Scottish Needs in Building Research."

Society of Chemical Industry

Birmingham: The University, 6.30 p.m. (Plastics and Polymer Group). Prof. H. W. Melville (University of Birmingham): "Copolymerisation and Related Phenomena."

Oil and Colour Chemists' Association

London: Royal Institution, Albemarle Street, W.1, 6.30 p.m. Professor M. G. Evans: "The Design of Experiment." First of three post-graduate lectures.

FRIDAY, OCTOBER 7

Incorporated Sales Managers' Association

Gleneagles, Perthshire: Gleneagles Hotel. 14th annual conference (until October 10). Discussion: "Sales Management—A Way of Reconciling the Welfare of the workers with the Changing Pattern of Consumer Demand."

Society of Public Analysts and Other Analytical Chemists

Sheffield: The University. 22nd ordinary meeting of the Physical Methods Group. Joint meeting with the RIC and Sheffield University Chemical Society organised by the Polarographic Discussion Panel. The meeting will be preceded by a visit to Bragg Laboratory, Naval Ordnance Inspection Department.

Royal Society for Prevention of Accidents

Scarborough: Royal Hotel. Chemical Safety Conference, organised on behalf of the ABCM (until October 9).

Photoelectric Spectrometry Group

London: Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, 2.30 p.m. Annual general meeting. Dr. Marcel J. E. Golay (Signal Corps Engineering Laboratories, New Jersey, U.S.A.): "The Pneumatic Infra-Red Detector," and "Multi-Split Spectrometry."

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. (North-Western Branch). Dr. S. B. Cormack: "Special Features in the Design, Construction and Operation of Plant for the Manufacture of Toxic Substances."

Technical Publications

A GREAT advance in solving the problem of providing satisfactory protection and decoration for ferrous metals subjected to extreme heat is claimed by the Atlas Preservative Co., Ltd., for its new aluminium paint No. 2845. The paint will withstand a temperature of 600° C. without damage to the paint film or loss of adhesion, and also has excellent weathering properties.

* * *

PROBLEMS of dust, wear due to heavy traffic, and attack by acids and oils on flooring have always to be borne in mind in industrial chemistry. A new surface treatment, "Isolament," which increases wear and resistance to chemical attack has been devised by Guaranteed Sanitation, Ltd., Islington, N.1.

* * *

AN aid to keeping up to date with the increasing number of standards is issued by the British Standards Institution in the form of revised sectional lists. PD.945 (August, 1949), covers revisions and additions to paints, varnishes, etc.

* * *

VARIABLE speed control units suitable for the chemical industry are described in the latest leaflet available from Sentinel (Shrewsbury) Ltd., Shrewsbury, England. The F.U. variable speed units described are manufactured in six sizes under licence from the French company Soc. Fabrications Unicorn.

THE treatment of grey cast iron by introduction of magnesium to produce castings containing graphite in spheroidal form is described by W. W. Braidwood and A. D. Busby in the *Nickel Bulletin* (August September. 22, 126-130) published by the Mond Nickel Co., Ltd.

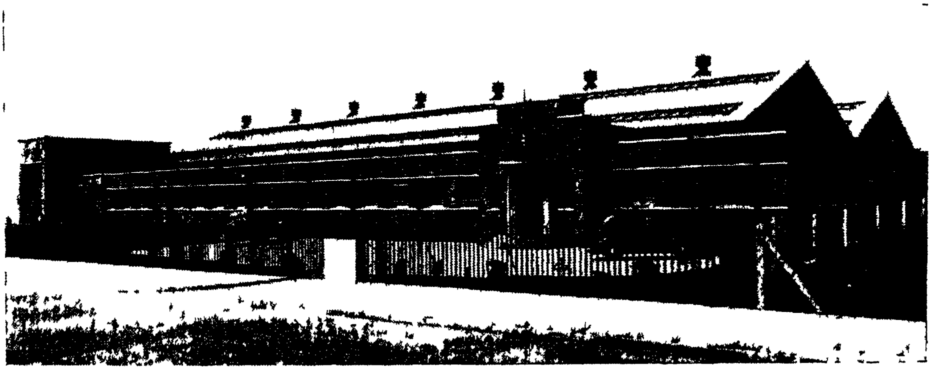
* * *

NEW designs in polythene containers suitable for users of corrosive liquids are announced by Tenaplas, Ltd., Upper Basildon, Berkshire. Features of the new types are original spout positioning, lightness of weight, and the extremely smooth interior resulting from the method of manufacture from extruded tubing. Buckets are made in two sizes, 1¼ and 2¼ gallons. and cans in five sizes, from 16 oz. to 1 gallon capacity.

* * *

A STEEL band conveyor that floats on a coolant is an ingenious plant development patented by the Steel Band Conveyor and Engineering Co., Ltd. Selly Oak, Birmingham. The water-bed conveyor carries the product on a solid steel band supported on water which is circulating, thus enabling material to be cooled and conveyed at the same time. The installation saves floor space, and reduces labour and cooling time. It is suitable for cooling gelatin, pitch, sulphur, grease, synthetic resin, metasilicate of soda and many other materials.

New Source of Chemical Plant and Appliances



Chemical and pharmaceutical machinery for a large range of tablet machines and automatic water stills is housed in the modern works newly occupied by Manesty Machines, Ltd., Speke, Liverpool. Ancillary equipment made here are granulators, coating pans, cone mills and drying ovens

ATOMIC EXPERTS HERE

Three Nations Confer on Sources

REPRESENTATIVES of the United Kingdom, Canada and the United States are attending a technical conference in London this week on problems of locating, mining and processing radioactive ores. The delegates will discuss exploration techniques, and analytical and extraction methods relating to radioactive ores.

The United Kingdom representatives will include Mr. M. W. Perrin, (deputy controller of production, Atomic Energy Division, Ministry of Supply); Prof. R. P. Linstead (ex director, Chemical Research Laboratory); Dr. W. F. P. McLintock and Dr. C. F. Davidson (Geological Survey of Great Britain); Mr. F. H. Burstall and Mr. T. V Arden (Chemical Research Laboratory); and Dr. R. Spence, Mr. G. S. White and Dr. D. Taylor (Atomic Energy Research Establishment, Harwell).

The Canadian delegation comprises Mr G. C. Bateman, Mr. A. H. Ross and Mr. R. H. Farmer; Dr. A. H. Lang and Mr. George Shaw; Dr. E. A. Brown and Mr. A. Thunaes; Mr. H. B. McGuffie and Mr. R. E. Manson.

The U.S. delegates will be Dr. C. K. Leith, Mr. T. F. Field, Mr. Evan F. Wilson and Dr D. L. Everhart; Dr. T. F. Nolan, Mr. J. C. Rabbitt and Mr. A. P. Butler, Junr.: Dr. A. M. Gaudin: and Messrs. B. D. Thomas, G. H. Clewett and W. Hirschkind.

Defining Radiation Risks

A THREE-power conference on radiation tolerances—the amount of radio-activity which human beings and animals may safely receive over specified periods—was held at the Canadian Atomic Energy Establishment, Chalk River, Ontario, on Thursday and Friday this week.

One of the primary purposes was to hold discussions leading to the establishment in Britain, Canada and the U.S.A. of uniform radiation tolerance standards between the atomic energy projects of the three nations.

The British delegation consists of Prof. J. S. Mitchell (Department of Radiotherapeutics, Cambridge University), Dr. G. J. Neary (Medical Research Council Radiobiological Unit, Harwell), Mr. A. C. Chamberlain (the Atomic Energy Research Establishment, Harwell) and Dr. E. F. Sdson (Principal Medical Officer at the Atomic Energy Production Factory, Springfields).

BRITISH SCIENTISTS IN U.S.A.

To Study U.S. Production Methods

NAMES of the first eight British scientists and technologists who will receive advanced technological training and practical instruction in American production methods under the technical assistance programme of the Economic Co-operation Administration were announced last week.

The scheme is designed to help to increase European production and efficiency, and a total of 50 scientists will be selected by the British Government. The remaining members of the group are expected to reach the U.S.A. early next spring.

The first party will be composed as follows:—

Mr. William Barnes, Feniscliffe, Blackburn, Lancs. (Cornell University, Ithaca, N.Y.—production engineering); Mr. William Eric Dennis, Kettering, Northants (Carnegie School of Technology, Pittsburgh, Pa.—physical chemistry of steel making); Mr. Malcolm Adam Gullen, Willowbrae, Edinburgh (Purdue University, Lafayette, Indiana—electronics); Mr. Gerald Houghton, London (Ohio State University, Columbus, Ohio—chemical engineering).

Mr. Harold William Paxton, Moss Side, Manchester (Carnegie School of Technology, Pittsburgh, Pa.—metallurgy); Mr. Douglas Willie Riley, Sheffield (California Institute of Technology, Pasadena, Calif.—chemical engineering in stable isotopes); Mr. Colin Greenwood Weir, Edinburgh (Illinois Institute of Technology, Chicago, Ill—electric power transmission); Mr. Peter Wilfred Dunn, Farnham, Surrey (Purdue University, Lafayette, Ind.—production and industrial engineering).

U.S.-British Scientific Liaison

TWO United States scientists of distinction, PROF. GORDON FERRIE HULL, JR., of Dartmouth University, and LYNN S. BEEDLE, of Lehigh University, are coming to London Shortly to investigate physics and metallurgical research carried on in Great Britain and on the Continent.

Prof. Hull, a member of the Dartmouth physics department since November, 1944, is to serve as physicist for the U.S. Office of Naval Research and will have his headquarters in the U.S. Embassy in London. He will deliver a series of lectures on various aspects of research which he has been conducting. The second scientist, Lynn S. Beedle, research engineer for the department of civil engineering at Lehigh University has been granted leave of absence to accept an invitation from Cambridge University to co-ordinate liaison on studies being made at the two universities on the strength of welded steel frames and their components.

· PERSONAL ·

LAPORTE Chemicals, Ltd., announced this week that MR. P. D. O'BRIEN and MR. B. E. A. VIGERS, directors, have been appointed assistant managing directors; MR. W. J. PIGGOTT, director and secretary, has voluntarily reliquished his appointment as secretary, which he had held for 27 years. MR. H. E. FARMER is the new secretary of the company.

DR. WILLIAM F. HESTER, formerly director of insecticide and fungicide research at the Rohm and Haas Co., Philadelphia, Pa., has been appointed administrator of the 13 fellowships of Koppers Co., Inc., at the Mellon Institute of Industrial Research, University of Pittsburgh. The doctor will be responsible for the research and development work by the 98 scientific workers and their assistants at the institute.

MR. W. E. CARTWRIGHT has been appointed secretary to the National Benzole Association in succession to Mr. P. G. Somerville. Mr. Cartwright has long been connected with the benzol industry. In 1919 he joined Strakers & Love, Ltd., as chemist at its Brancepeth coke works. Nine years later he was appointed installation chemist to the Newcastle Benzol Co., retaining his position when it was acquired by the Natonal Benzole Co. the following year. In 1935 Mr. Cartwright became control chemist at the Willesden laboratories, and four years after was transferred to head office as technical adviser.

Mr. W. E. Cartwright

Mr. H. M. Garner, newly appointed chief scientist to the Ministry of Supply

MR. ARTHUR COCHRANE has been appointed chairman of H. J. Elliott, Ltd., makers of E-Mil laboratory glassware and thermometers, at Treforest Trading Estate, Nr. Pontypridd, Glamorgan. Mr. Cochrane is assistant managing director of the Triplex Safety Glass Co., and subsidiary companies, including Quickfit & Quartz, Ltd., manufacturers of scientific glass apparatus and industrial glass plant.

SIR REGINALD STRADLING has been appointed Dean of the Military College of Science, in succession to the late Professor C. H. Lander. Sir Reginald Stradling was chief adviser on research and experiments for the Ministry of Home Security during the war.

DR. F. RIESENFELD has terminated his appointment with Catalia, Ltd., of Waltham Abbey, Essex, of which he was a director. He had been technical manager since 1936.

Obituary

EX-BAILIE ALEXANDER KENNEDY, who founded the firm of Kennedy and Reid. Parkhead Oil Works, Glasgow, of which he was sole partner when he gave up business at the beginning of the war, has died at his home, Kenmill, Bothwell. He was 96. He was a member of Glasgow Town Council for many years and was senior magistrate for five years.

◆ HOME ◆

Stewarts and Lloyds' Extending

The Rutherglen Dean of Guild Court has granted permission to Stewarts and Lloyds, Ltd., Glasgow, to erect buildings estimated to cost £138,000, in Dalmarnock Road, Rutherglen, for the production of steel fittings. Employment will be provided for 200.

Machinery Rehabilitation

Fescol, Ltd., has opened at Port Glasgow a new factory, which is the first plant of its type in Scotland, for the rehabilitation of engineering parts by coating them with a resistant nickel or chromium surface. The process has been particularly successful on turbine gears, hydraulic rams, steel mill rollers, automobile parts and turbine blades.

Chemistry's Aid to Textiles

Application of various chemicals to the textile industry to improve the quality of yarn, for ensuring thorough wetting of fibres under acid conditions, and as an efficient mildew preventative in felts and yarns, will be demonstrated by Monsanto Chemicals at the Textile Machinery and Accessories Exhibition to be held at Belle Vue, Manchester, next month.

Borax and Boric Acid Prices

Increased prices for all grades of borax and boric acid, provisionally to take effect from October 22, are notified by Borax & Chemicals, Ltd. The new levels, per ton in ton lots, carriage paid, include: Borax; anhydrous, £59 10s. (present price, £46); commercial granular, £36 (£27); powder, £39 (£30); extra fine powder, £40 (£31). Boric acid; commercial granular, £64 10s. (£48); powder, £67 10s. (£51-£53); extra fine powder, £69 10s. (£53).

Producing for Dollar Markets

The Incorporated Sales Managers' Association announces that National Sales Executives (an American association) has accepted an invitation to hold, in London next February, a joint conference on techniques of distribution. Sales managers here believe that the attempt to double the sales of British goods in U.S.A. cannot succeed until many sections of industry are prepared to relate their production planning to the requirements of dollar markets. It is noted that the Anglo-American Productivity Council has no sales member. All organisations interested in the sale of British goods in dollar markets will be invited to participate in the conference.

Spanish Trade Prospects

Belief that an important market existed in Spain for Scottish goods and that Spain and Scotland could trade with benefit has been expressed by Lord Provost Victor Warren, of Glasgow. Spain needed British chemicals, fertilisers, machinery and rubber, he told the Rotary Club last week, while in return she could send fruit, wheat and oil.

Increased Distilling

Highland Distilleries Co., Ltd. are to reopen Speyside distilleries for the season immediately and expect to work continuously until June. Scottish malt distillers put many of their distilleries into production on September 25. According to the Scotch Whisky Association production this year will reach some nine million gals. in the Highlands area, while the total Scottish prospect, based on the available grain, is estimated at 30 million gal.

New Penicillin

Three new penicillin preparations are being introduced by Glaxo Laboratories, Ltd., Greenford, Middlesex, with effect from October 3. These are Prolopen (an oily injection of procaine penicillin G with crystalline sodium penicillin G); crystalline penicillin G ointment Glaxo; and crystalline penicillin G eye ointment Glaxo. It is also announced that prices for the company's penicillin will be decreased from the same date. This is the fifth reduction in less than three years.

German Technologist in Scotland

A German specialist, Herr L. Casagrande, now one of the staff of the building research station at Watford, Herts., is making an important contribution towards preparing for the erection of the big oil refinery sponsored by Scottish Oils, Ltd., at Grangemouth. A report in *The Scotsman* states that Herr Casagrande is applying at Grangemouth the technique, based on electro-osmosis, which he developed in Germany during the war to permit the erection of massive submarine pens in unstable soil. The present objective is to stabilise the sub-soil, no suitable stratum having been located during drilling to below 100 ft., and permit the creation of a "floating" platform on which the foundations of the refinery, on which some £12 million is being spent, can be securely based.

OVERSEAS

New Italian Petroleum Refinery

The petroleum refinery now under construction at Mantua (Italy) is expected to be ready for production during 1950. The new plant will be capable of dealing with 250,000 tons of crude per annum.

Water Power for Uganda

A £3,639,540 contract has been obtained by a group of British firms, including Dorman Long, and Dutch firms, to build the Owen Falls Dam in Uganda, to afford cheap hydro-electric power and form the first part of a 25-year scheme for the fuller cultivation of Egypt.

World's Largest Steel Furnace?

Thought to be the largest in the world, with a 550-ton capacity, a new open-hearth steel furnace has been placed in operation at the Weirton Steel Company, Weirton, West Virginia, a subsidiary of the National Steel Corporation. The furnace, with more than three times the average capacity, was rebuilt from one with a capacity of 200 tons. The furnace turns out low carbon steel, which constitutes the great bulk of annual steel tonnage.

New Colour Pigment for Rubber

Development of a fine silica pigment which will enable both natural and synthetic rubber products to be manufactured in many colours has been announced by the Columbia Chemical Division of the Pittsburgh Plate Glass Co., Pittsburgh, Pennsylvania. The product known as Hi-Sil was developed in the company's research laboratories at Baberton, Ohio, and is claimed to be the first silical pigment to be produced in large quantities at low cost.

Oil Plant for Russia

The United States Department of Commerce is reported to have approved the immediate export to the U.S.S.R. of $500,000 worth of oilfield machinery. New York trade circles state that 40,000 tons of Russian manganese and chrome ores are being shipped to the U.S.A.

Anti-Trust Suit Postponed

The United States Government's anti-trust suit against E. I. du Pont de Nemours & Co., Inc., charging restraint of trade through various agreements with other companies has been postponed at the Government's request until April 3, 1950.

Australia Reviving Whaling Industry

A revival of the whaling industry, which has been in abeyance since 1927, is being undertaken by the Australian Government at Shark Bay, Western Australia. The decision to re-establish the industry was partly due to development of the hydrogenation process to remove the natural odour and taste from whale oil.

Italy's Smaller Chemical Exports

In the first half of 1949, nearly all the chemical exports from Italy showed decreases compared with the corresponding period of 1948. Notable among the few increases was tartaric acid, 8800 tons against 465 tons last year. Caustic soda exports fell to 6298 tons from 32,649 tons. Paints, varnishes and dyes registered 6390 tons against 6600 tons.

Raw Materials for Austria's Chemical Industry

An increasing quantity of raw materials for the chemical industry is reported to have been received by Austria during the last quarter. These were mainly under ERP, but some also under existing trade agreements. Commodities such as crude rubber, phenol and dyestuffs, however, remain in short supply.

U.S Sulphur Production

Production of sulphur in the U.S.A. in June totalled 399,025 long tons, a decrease of 18,501 tons from the previous month. Total for the first six months of 1949 remained at approximately the same level as the corresponding period in 1948—2,383,473 tons against 2,394,509 tons. Apparent sales showed a decrease in the month of June, but for the first half of this year showed no appreciable change over the same period of 1948.

New U.S.-Canadian Company

The Standard Company, Ltd., and General Aniline & Film Corporation, of New York, have jointly formed a Canadian company, Chemical Developments of Canada, Ltd., with $14 million authorised capital to manufacture in Canada organic chemicals based upon the technical and assigned patents of General Aniline & Film Corporation. Many of the proposed products have not previously been produced in Canada. The first to be manufactured will be a group of synthetic non-ionic detergents utilising ethylene oxide as a raw material. The engineering and design of a new plant for this purpose is well advanced.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary ,but such total may have been reduced.)

Midland Plastic & Granolithic Co., Ltd., Birmingham. (M.. 1/10/49.) August 18, mortgage, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 38 Gravelly Hill North, Erdington, Birmingham, with fixtures. *Nil. June 25, 1947.

Zenolume, Ltd., Harrow, scientific glassware manufacturers. (M., 1/10/49.) August 23, £600 debenture, to G. E. Gladding, Guildford; general charge. *Nil. June 30, 1947.

Satisfactions

Pioneer Oil Sealing & Mouldings Co., Ltd., Southam, oil sealing engineers. (M.S., 1/10/49.) Satisfactions August 25, £1250 registered December 4, 1946, and £1250 registered August 14, 1947.

Company News

Albright & Wilson Ltd.

An interim dividend of 10 per cent on the ordinary capital for the year ending December 31, 1949, was announced at a recent meeting of the board.

British Glues and Chemicals, Ltd.

At the 29th annual general meeting, consolidated profit was announced as £106,418 (£113,606) of which £92,488 is available for distribution. Net dividends are the same as previous year, amounting to £28,875 on preference stock and £24,062 on ordinary stock; £39,551 is carried forward.

The directors of Imperial Chemical Industries, Ltd., have declared an interim dividend on the ordinary stock of 3 per cent (actual) for the year ending December 31, 1949. The dividend will be payable on December 1.

Powell Duffryn, Ltd.

A final dividend is recommended of 5 per cent (same) on the £9,660,471 ordinary capital for the year ended March 31, 1949, making, with the interim dividend (paid February 23) 8 per cent for the year. Net profit for 1948-49 is £652,106 (£939,176).

Increases of Capital

The following increases in capital have been announced: Joseph Mason & Co., Ltd., from £40,000 to £80,000. Burmah-Shell Oil Storage & Distributing Co. of India, Ltd., from £1,000,000 to £4,000,000. Smo-Rex, Ltd., from £500 to £10.500.

Change of Name

The following change of name has been announced: Peerless Chemical Laboratories, Ltd., to Peerless Precision Products, Ltd.

New Registrations

Thanet Moulders, Ltd.

Private company. (473,110.) Capital £1000. Manufacturers and workers of plastic and thermoplastics, phenol, cyanides and cyanogen products; gold extractors, etc. Directors: H. J. Gordon, R. Challenger, J. L. Cuming and R. G. Hughes. Reg. office: 3 Lloyd Road, Broadstairs, Kent.

Aerite, Ltd.

Private company. (473,115.) Capital £2000. Manufacturers of fertilisers, sprays, disinfectants, insecticides. Director. A. Monteith. Reg. office: 95a, Chancery Lane, W.C.2.

E. Law & Sons (Shellac), Ltd.

Private company. (473,134.) Capital £3000. Objects: To acquire the business of a shellac bleacher, dewaxer and refiner carried on by Wm. Law at Usk Street, E.2, as "E. Law & Sons." Directors: W. Law and E. R. Law. Reg. office: 14-16 Usk Street, Bethnal Green, E.2.

Fire at Fisons

Considerable damage was caused by fire on Monday at West Bank Dock stores of Fisons, Ltd., at Widnes, where bales of hessian and paper bags ignited and may prove to be a total loss. It was stated the incident would not interrupt operations.

The Stock and Chemical Markets

SHARE values have lost part of the advance that followed devaluation of the £. More cautious views are prevailing, now that many other countries have also devalued their currencies, and this has led to extremely keen competition for export business to the U.S.. While many British companies have excellent prospects of increasing their dollar income from export trade, with a resultant increase in profits, this would not mean more for shareholders as long as the dividend limitation request remains in force. It is felt in the City that devaluation of the £ will make inevitable before long the easing or dropping of further controls.

Already, tin is decontrolled and the partial reopening of the London Metal Exchange, now projected, may foreshadow the freeing of all metals if Britain's dollar income improves.

Talk of a general election before the end of the year has also enforced caution, because the result would, of course, have considerable effect on long-term developments.

Chemical and allied shares moved back with the general trend in industrials. Imperial Chemical, for instance, reacted to 43s., Turner & Newall to 76s. 10½d., United Molasses to 40s. 6d. and Dunlop Rubber to 63s. The prospect of reopening of the London Metal Exchange stimulated a rise of 3s. 1½d. in Metal Traders to 55s. 7½d., while Amalgamated Metal shares were 1s. up at 19s. 6d.

Higher price of tin caused a drop of 2s. 6d. in Metal Box shares to 93s. 9d. The higher price of copper also led to an easier trend in electrical equipment shares, among which General Electric were 80s. 6d. and Associated Electrical 76s. 9d. Iron and steels reacted on reported reduced demand for steel from industries mainly confined to the home market. United Steel were back to 25s. 9d., although the pending dividend is expected to be maintained, while Stewarts & Lloyds eased to 53s., Dorman Long to 29s. 6d. and Colvilles to 33s. Elsewhere, Babcock and Wilcox came back to 61s. and Allied Iron to 38s. 9d.

Fears that the economy move may mean reduction in building rendered Associated Cement easier at 74s. 3d. and paint shares lost a little ground, Pinchin Johnson being 35s. 3d.

Fisons have changed hands around 28s. 6d., Monsanto were firm at 51s. 10½d. Laporte Chemicals 5s. shares 9s. 6d. " ex " the bonus and Lawes Chemical 10s. 6d., while Major and Co's shares were 2s. 6d. W. J. Bush were marked back to 75s. The 4s. units of the Distillers Co. came back to 27s. 7½d. British Xylonite were lower at 72s. 6d., while De La Rue were 23s. 9d. and British Industrial Plastics 2s. shares 5s. 1½d. British Oxygen eased to 94s. 4½d. in accordance with the prevailing trend and British Aluminium were slightly lower at 43s.

Levers have been steady at 43s. 3d. British Glues and Chemicals 4s. shares at 19s. 6d. lost their recent improvement. Boots Drug eased to 50s. 6d., but Borax Consolidated were firm at 59s. 4½d. Glaxo Laboratories were back to £18¼, following their recent advance. British Drug Houses 5s. shares were 6s. 9d., Sangers easier at 24s. 9d. and Beechams deferred 14s. 9d.

Oils reacted, Shell to 70s. and Trinidad Leaseholds to 26s., while Ultramar were an erratic market. Mexican Eagle rose to 17s. 9d. following news of the capital repayment.

Market Reports

BUSINESS in chemicals generally has been on a fair scale during the past week, most of the routine lines moving steadily into consumption. Export inquiry has been good, but trading conditions show little alteration and prices are mostly unchanged. A notable exception is the higher quotations for the chemical compounds affected by the increase in non-ferrous metal prices. The revised basic price for dry white lead is now £146 per ton (£30 10s. up) and for ground white lead £163 per ton. The revised price for red lead is £138 per ton. The home demand for the coal tar products remains quiet and pitch continues to be in fair request. Some expansion in the export inquiry for phenol and ADF cresylic acid is reported, within a limited price range.

MANCHESTER.—The demand for the non-ferrous metal compounds on the Manchester chemical market during the past week has been adversely affected by the sharp price increases and it is likely to be some weeks before conditions in these sections settle down. There is a good demand for the alkalis and the general run of heavy chemicals. Deliveries of these to the principal consumers during the week have been on a reasonably satisfactory

(continued at foot of page 474)

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of fluorine containing hydrocarbon derivatives.—Imperial Chemical Industries, Ltd., A. J. Rudge and A. J. Lowe. March 27 1944. 628,454.

Preparation of organic mercury compounds.—F. J. Sowa. Aug. 5 1943. 628,525.

Oxidation of aliphate hydrocarbons.—A. H. Stevens (Cargill, Inc.). Nov. 27 1944. 628,457.

Electrodeposition of lead-antimony-tin alloys.—A. A. Thornton (Cleveland Graphite Bronze Co.). July 10 1945. 628,459.

Dielectric compositions.—Titanium Alloy Manufacturing Co. April 10 1943. 628,536.

Fire extinguishing systems.—Foamite, Ltd. Oct. 27 1944. 628,738.

Method and apparatus for separating immiscible fluids.—J. R. Howden (Selas Corporation of America). April 23 1946. 628,464.

Coated threads or the like of synthetic linear polyamide resin.—S.p.A. Lavorazione Materie Plastiche. Feb. 25 1943. 628,466.

Moulding plastic materials by extrusion. —S.p.A. Lavorazione Materie Plastiche. April 3 1943. 628,467.

Mixing and compressing of plastic masses.—S.p.A. Lavorazione Materie Plastiche. Feb. 15 1944. 628,468.

Process for preparing a preparation containing salicylanilide. — Nederlandsche Centrale Organisatie Voor Toegepast) Natuurwetenschappelijk Onderzoek. Aug. 22 1945. 628,564.

Manufacture of vat dyestuffs.—Ciba, Ltd. July 27 1945. (Cognate Application 22308/46). 628,566.

Compositions containing cellulose esters and ethers.—British Celanese, Ltd. Sept. 13 1945. 628,477.

Interpolymers of acrylamide and methacrylamide.—General Aniline & Film Corporation. Oct. 16 1945. 628,479.

Process for colouring hydrophobic substances soluble in hydrocarbons.—Ciba, Ltd. Nov. 16 1945. (Cognate Application 31708/46.) 628,598.

Inhibiting the dehydro-halogenation of halogenated organic compounds.—Mathieson Alkali Works. Nov. 27 1945. 628,485.

Process of producing alkali metal chlorites from chlorine dioxide.—Solvay & Cie. Dec. 15 1945. 628,487.

Manufacturing of semi-conducting bodies, consisting of titanium oxide.—E. H. Schaefer. Dec. 10 1946. 628,491.

Apparatus for drying or crystallisation by spraying.—D. d'Ans. Dec. 28 1945. 628,758.

Process for the stabilisation of organic compounds of high molecular weight containing inorganic acid-forming elements. —Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 26 1946. 628,622.

Process for the recrystallisation of melamine.—Ciba, Ltd. Feb. 8 1946. (Cognate Application 2135/47 and 2136/47.) 628,631.

Production of aryl-β : 8 -dihydroxypropyl ethers.—British Drug Houses, Ltd., W. Bradley and J. Forrest. Feb. 12 1947. (Cognate Application 2609/48.) 628,497.

Production of organic hydroxy compounds.—Imperial Chemical Industries, Ltd. and J. G. M. Bremner. April 23 1947. 628,503.

Hydrolysis of organic esters.—Soc. Normande de Produits Chimiques. Jan. 29 1946. 628,656.

Synthesis of esters.—E. I. Du Pont de Nemours & Co. and W. F. Gresham. May 7 1947. 628,509.

Synthesis of organic nitrogen compounds.—E. I. Du Pont de Nemours & Co. and W. F. Gresham. May 16 1947. 628,659.

Production of butadiene.—Universal Oil Products Co. Oct. 29 1943. 628,686.

MARKET REPORTS

(continued from previous page)

scale and fresh inquiry and actual business have been in the market. Some sections of the fertiliser trade, including the compounds, have been fairly active. There has been little change in conditions in the tar products market and only a moderate amount of new business has been reported.

GLASGOW.—Business in general has come practically to a standstill since the devaluation of the £, and it appears as if it will be almost another week before trading becomes anything like normal. In the export market, where one would have expected a boom in inquiries, there has been practically no activity.

BP Codex Challenged

A RECENT prosecution in Dublin District Court raised the question of admissibility as a standard in Ireland of the British Pharmaceutical Codex. The case was adjourned until October 12. It was brought by Dublin Corporation against Samuel T. Smith, a chemist, who was alleged to have sold a jar of chilli paste which was not of the nature, substance and quality of the article demanded.

The defence objected to the form of the certificate of analysis issued by the Dublin city analyst, who said the paste did not contain any menthol, camphor, or chloral hydrate. He mentioned that he was guided by the standard of the British Codex.

Counsel for the defence objected to any reference to the Codex, on the ground that it was not admissible and had no official standing in Ireland.

The prosecuting solicitor said that the standards set up by the British Pharmaceutical Codex had been accepted in Ireland for years, and he submitted that there must be very strong evidence to rebut those standards.

Counsel for the defence agreed that the British Pharmacopœia did not need to be proved; objection was to citation of the British Pharmaceutical Codex.

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Details of other special courses may be obtained from the Principal.

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of* 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

ALBRIGHT & WILSON Ltd., require a **CHEMIST** for Technical Service and Product Development work in the Alginate Department. Age 30-40, preferably with some experience in industry. Apply in writing to the MANAGER, Alginate Department, 49 Park Lane, London, W.1, with full details of education and career.

ASSISTANT WORKS ENGINEER required for construction and maintenance of Chemical Works in West Riding, Yorkshire. Applicant should be 25-35 years of age. Should have sound theoretical training and practical experience in mechanical engineering and chemical works plant. Salary approx. £600 p.a. Pension Scheme. Applicants should state age, full details of training and experience to **Works Manager, Box No. 2840, THE CHEMICAL AGE, Fleet Street, London, E.C.4.**

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LARGE PETROLEUM COMPANY has vacancy in London for **CHEMIST** with experience in the **DETERGENT FIELD.** Age, 22 to 30 years. Applicants should have a University Degree in Chemistry, preferably an Honours Degree. Good prospects. Pension Fund rights. Write Box Z.K.421, DEACON'S ADVERTISING, 36, Leadenhall Street, London, E.C.3.

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SENIOR LABORATORY CHEMIST required by manufacturers of a comprehensive range of Bituminous industrial materials. Approximate salary £520 p.a. Please state in writing full details of qualifications, and experience of formulation and production, age and past appointments to **BITUMEN INDUSTRIES LIMITED, Farnham Road, Trading Estate, Slough, Bucks.**

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A Lesson in Realism

THERE has been no incident more encouraging as an earnest of the comradely attitude of industrial interests, and some others in America, towards their counterparts here than the policy which resulted in the cordial reception in steelworks across the width of the U.S.A. during March and April this year of 16 British steel founders. They were the first "Productivity Team," whose departure received an amount of publicity which indicated how hopeful we were of the results of this innovation, sponsored by the Anglo-American Productivity Council and cordially aided by the British Steel Founders' Association and individual companies, trades unions, the Treasury and the ECA. Proof that that hopefulness was not misplaced is yielded by what is now recorded in the productivity team's report, "Steel Founding,"* which proves beyond all doubt that at least one great section of American industry was ready to receive colleagues from this country, conceivably their competitors in some world markets, and to place at their disposal, apparently without reserve, any information which might help to make British steel founding cheaper and more productive.

The heartening effect of this very ably presented and comprehensive report is derived not so much from the harvesting of a great deal of new technology as from the practical proof it contains that the most wholehearted kind of collaboration can be attained in all ranks of British industry in the interests of making it more profitable. The participation of moulders, a dresser, a pattern maker, a chargehand and a foreman moulder helped to ensure that a completely balanced picture was obtained of practices employed in the U.S. foundries, for critical comparison with what is customary here. Thus has been formed a pattern for the productivity teams of several other British industries which, it is hoped, will follow the same path. Better, new emphasis has been given to a lesson which is slowly learned here, notwithstanding the obvious truth of it: that no satisfying degree of efficiency and prosperity can be attained while any category of workers declines to collaborate. The steel industry is admittedly better placed than some others by having a long record of good relations between all ranks, which even the Government's introduction of controversial issues,

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* "Steel Founding," published for the British Steel Founders' Productivity Team by the Anglo American Council on Productivity, 21, Tothill Street, London, S.W.1; 3s.

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represented by the Iron and Steel Bill, has failed to embitter.

"Steel Founding" is much more than a technical report, because of the intelligent appreciation by the investigators that the great productivity of the U.S. foundries—between 50 and 90 per cent greater than ours—cannot be reproduced, even if it were economically practicable, merely by the operation of advanced equipment and time-saving procedures—although much has been observed in this connection and is to be handed on to a series of technical conferences within the industry. American steel founding, like most other industries, is much more highly mechanised than ours and, having a vast market, can take much greater advantage from standardisation than is possible here and give financial inducements to buyers to secure long continuous runs. The report gives an extremely clear picture of these and all other relevant factors which help to make possible the gargantuan American output, but the team clearly was impressed more than by anything else with the intangible springs which make the U.S. machine turn over so much faster than ours. They sum it as "a widespread degree of productivity consciousness"—an ugly term to describe a virtue, which future productivity teams may expect to find operating in many other spheres in America. In steel foundries, at least, we are assured that the individual drive to produce more, sustained by the knowledge that success will certainly bring reward in the shape of a more ample standard of living, is the conspicuous thing. It may be thought that it was not necessary to send 16 men across the Atlantic to discover what many already knew. The facts, however, have never before been so lucidly presented with appropriate illustration of how in America encouragement is given to the drive to produce more than somebody else—the other steelworker or the other corporations. It is no mere coincidence that today the top ranking American steel operative, were he paid in sterling currency, would be getting some 12s. 6d. per hour.

Being completely objective, the team observed the harsher aspect of the same principle, the penalties incurred by those who fail to reach the standard, in a country in which unemployment money assistance is infinitely lower than obtains in a "Welfare

ontinued on page 480)

Notes and Comments

Who Wants It?

THE hollowness of the case which the country has been invited to accept—to permit the State to monopolise the great bulk of Britain's iron and steel production—has been emphasised yet again. An addition to the very revealing publications which have been offered, many of them, unfortunately, after the decision to engulf iron and steel had been made, comes from Mr. Aubrey Jones, who expresses the views of the Iron and Steel Federation as well as the expressed opinion of men employed by the industry. "If Steel is Nationalised" (Hodder & Stoughton, 1s.) is chiefly remarkable for the proof it provides that what workers have said in the immediate past gives no sanction for the Government's intentions; very much the reverse, as excerpts from statements by the Iron and Steel Trades Confederation show. One of these claims that there is little indication that workers will be inspired by higher motives when working for the nation rather than for shareholders. "Too many workers see in public ownership only an opportunity to exploit rather than a chance to serve," the confederation's secretary has written. The increasing success of joint consultative councils, now operating in many large firms, is a further pointer that management and labour—when they understand each other's aims and difficulties—can work in harmony for greater efficiency and production; there is very little doubt that they will do so much better without the heavy hand of the State to guide them. The best way to ensure public control of an industry, says Mr. Jones, is to leave ownership in private hands and to place a checking authority over it. It has been made very obvious that no adequate counterpart of that guardianship of the public's interest exists once ownership has been transferred virtually to a Minister and an inaccessible national board.

DSIR in War and Peace

THE possibility that in years to come the Department of Scientific and Industrial Research will come to be regarded as the most faithful continuous recorder of the growth and achievements of State-aided industrial research—besides being an instigator of it—is called to mind by the latest addition to the great collection of DSIR publications. This is the department's "Report for the Year 1947-8" (HMSO, 2s. net), which, including a brief review of all that was done in the unrecorded years of the war, may be greatly sought hereafter by those who look for a very condensed history of national collaboration for scientific ends in the uneasy years since 1938. All the great enterprises, such as the "Tube Alloys" project, which culminated in the atomic bomb, radar and some less warlike research have, of course, had their independent chronicles; here their places in the complex of research for peace and wartime objectives are now more clearly pictured. Created in one war (February 1915), the DSIR has always been obliged to serve emergency needs, of industry in times of economic trouble and of the nation at war. Its ambition to pursue a substantial programme has never been realised. Yet when it is recalled how rich have been the department's services in advancing technology in industry and making known the results, besides its wise and discriminating administration of Government aid to group research, it may be doubted if the utilitarian rôle could have been bettered.

Sawdust Plastics?

WASTE wood, in whatever form it occurs, offers a challenge to all who are concerned with the conservation of resources. It does not belittle the several rewarding and occasionally ingenious uses of uncommercial forms of lignin and cellulose to admit that the amount usefully employed is trivial compared with the immeasurable quantities that are neglected. America, with its great lumber industry, receives the challege even more directly than we do and, it must be admitted, has gone farther towards meeting it. While sawdust has found rewarding chemical and engineering uses here, none would seem to have as much promise of profitable development in serving a characteristically modern need as the recent work in the U.S.A. credited to the Patterson Plastics and Chemical Company, of which a stimulating brief account is given in *Industrial and Engineering Chemistry* (1949, September, 10A).

Resists Radiation

THE significance of the new work reported in the American journal consists in establishing that pine sawdust can be chemically transformed to serve not merely as a plastics filler, but as the raw material of a satisfactory thermosetting plastic which can be modified to present the attractive property of substantially arresting nucleonic radiation. Not adapted to withstand the heat of a nuclear reactor, it might, however, serve as a very useful shield for radioactive materials in which the heat factor is not present. The transformation, says *Industrial and Engineering Chemistry,* depends upon a chemical reaction in which the cellulose, hemicellulose and lignose of the sawdust form a chemical compound with physical properties entirely different from those of the starting material. An alkaline hydrolosis is followed by acidification to pH 6.5 and treatment, at different stages, with formaldehyde-ethylene dichloride solution and with a 50 per cent solution of urea crystals, 1 lb. of urea being employed to treat 4 lb. of the material. The full process is evidently not simple or inexpensive, but the good compression moulding and other desirable characteristics foreshadow good prospects for this novel use of timber waste.

A LESSON IN REALISM

(*continued from page* 478)

State." Competition, between individuals, between firms and even industries—steel castings *versus* weldments and drop forgings are examples—is the governing factor and so wholly is the principle accepted that even the powerful labour unions are unwilling to challenge it. The English steelfounders preserved all their critical faculties, so that nowhere in their report is it overlooked that not all the American ways are practicable or even desirable. Philosophy and technology are both given their full value, as in no other industrial report we have seen, and there are no didactic conclusions. In that respect the steel founders have shown a maturity of judgment which strikingly contrasts with most of the "pep talks" which all industries here are accustomed to receive from other quarters. "Steel Founding" may indeed be cited as a model for all who pass judgments in industrial affairs, as well as for future "productivity" teams.

A Rennet Anniversary

SEVENTY-FIVE years ago—in 1874—a Danish chemist gave the dairying industry one of its great technical advances, which also led to the establishment, in the same year, of Christian Hansen's Laboratory, a name which has become a household word in every country possessing a dairy industry. Christian D. A. Hansen, working as an assistant in the chemical laboratory of the University of Copenhagen, succeeded in producing a cheese rennet that was pure, would keep, and could be adjusted to a required strength. He had been working on pepsin, a related enzyme, and started experimenting to produce rennet. Although the rennet enzyme is far more sensitive than pepsin, he succeeded. The value of his discovery was immediately recognised, and before two years had passed exports were being made throughout Europe. Christian Hansen devoted the rest of his life to developing the great aid to cheese production, and today the Hansen product remains the standard in the absence of an objective method of measuring the strength of rennet.

SCIENTIFIC FREEDOM

Prof. Bernal's Charges Rebutted

STATEMENTS concerning the direction of scientific effort in Britain reported to have been made by Prof. J. D. Bernal during his recent visit to the U.S.S.R., were repudiated by Sir Edward Appleton, principal of Edinburgh University, in a speech in Edinburgh on Monday.

"I would like to tell our scientific friends from oversea," he said, "that I know of no country where there is warmer support for scientific research than in Great Britain. Moreover, the substantial financial provision for research is largely associated with great freedom for the scientific worker.

"Indeed, in our universities such freedom is complete. The fact that such provision is by way of grants and not by way of contracts is indicative of this.

"It is for this reason that the great majority of scientists completely repudiate Prof. J. D. Bernal's statement . . . to the effect that the direction of scientific effort in this country is in the hands of those who hate peace and whose only aim is to destroy and torture people. This assertion is a striking illustration of the fact that . . . one often finds a scientist who, while not ready to accept any scientific result until it is fully tested, is quite ready to voice wholly untested opinions about other matters in the most dogmatic and prejudiced manner.

"The facts are that Prof. Bernal is receiving a great deal of financial support for his own researches from public funds by way of the Department of Scientific and Industrial Research and the University Grants Committee, such funds being derived from taxes imposed on a predominantly private enterprise society; and if the direction of his scientific work is not in his own hands the fault is clearly his.

"It would appear that, as in a few other similar cases, there are two Prof. Bernals: one is the brilliant natural philosopher of world-wide renown, the other the fervid convert to an extreme political theory. Such a perverse interpretation of the situation as regards research in Britain would never have been made by the former."

Sir Edward Appleton was speaking at a dinner to the International Council for the Exploration of the Sea, at which the Secretary of State for Scotland, Mr. A. Woodburn, was the host.

NAMING THE ELEMENTS

IUC Decisions Reported to ACS

THE first announcement of the decisions of the International Union of Chemistry, taken at the Amsterdam Conference in September, to adopt new names for a number of elements was made at the 116th International meeting in Atlantic City, New Jersey, last week, of the American Chemical Society. Most of the names are new only in the sense that they have not before had formal recognition or were one of alternatives.

Dr. Alexander Silverman, head of the department of chemistry in the University of Pittsburgh, reporting on the decisions at Amsterdam, said that tungsten, No. 74 in the periodic table, the hard metal used in the manufacture of electric light filaments, steel alloys and cutting tools, would be internationally designated wolfram.

Recognition of niobium instead of columbium as the official name of element No. 41, and the confirmation of the names of plutonium and the seven other new elements discovered during the war were among the other outstanding decisions made at the Union Conference, Dr. Silverman said. Among the names approved was that of promethium for element 61.

"Wolfram" comes from wolframite, the ore in which the element was first discovered. Oddly, the accepted symbol for the element has been W, even in the United States and England, where tungsten was the name generally employed.

The change from columbium to niobium for element 41 also is of special significance to American scientists and engineers, for columbium has been the American name while niobium has been the choice of England, France, Germany, Russia, and most other countries.

Other names adopted officially for older elements are: beryllium, rather than glucinium, for No. 4; hafnium for No. 72; lutetium rather than lutecium for No. 71, and protectinium rather than proto-acitinium for No. 91.

As had been expected, the so-called transuranium elements, man-made in connection with the atomic bomb project, received the names proposed by their discoverers—neptunium for No. 93, plutonium for No. 94, americium for No. 95, and curium for No. 96. The four other synthetic elements named by the International Union were: technetium (43); promethium (61); astatine (85); and francium (87).

Non Ferrous Metal Totals

Still Large Stocks of Copper, Zinc and Tin

THE not unexpected trend revealed in the details of production, consumption and stocks of non-ferrous metals in the United Kingdom in August, supplied by the British Bureau of Non-Ferrous Metal Statistics, an abstract from which is published below), is a fairly general increase in stocks.

Closing stocks of blister copper were 5996 tons more than at the end of July; those of refined copper increased by 1868 tons. unwrought zinc in concentrates by 6665 tons; slab zinc (all grades) showed a decrease of 5975 tons.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
OPENING STOCKS:		
Govt and consumers' ...	51,623	90,461
Imports	11,823	18,197
PRODUCTION:		
Primary	—	5,196
Secondary	2,168*	3,820
CONSUMPTION:		
Primary	5,265	24,913
Secondary	—	13,162
Exports	3,758†	17
CLOSING STOCKS:		
Govt. and consumers'	57,619	92,329

*Rough copper

† Includes 2553 tons rough copper dispatched to Belgium and 1205 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,142	long tons
Alloyed copper products	20,144	„ „
Copper sulphate	1,800	„ „

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	23,356	81,718
Imports	12,213	7,347
PRODUCTION:		
Virgin and remelted ...	—	4,695
CONSUMPTION:		
Virgin (incl. debased)	5,548	15,795
Remelted and scrap ...	—	6.855*
Exports and Re-exports	—	38
CLOSING STOCKS:		
Govt. and consumers'	30,021	75,743

*Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Lead in Concentrates	Long Tons Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers'	—	52,023	2,656	—
IMPORTS ...	—	26,278	—	271
PRODUCTION ...	145	- -	1,861	- -
CONSUMPTION ..	151	15,300	2,510	9,013
Exports	-—	13	—	-
CLOSING STOCKS:				
Govt. and consumers'	--	63,210	2,007	-

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,978
IMPORTS	199
PRODUCTION	1,596
CONSUMPTION	1,673
EXPORTS AND RE-EXPORTS	157

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	380
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	279

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	33.85

The Free Imports

ONE of the first reactions to the Government decision to remove import licence restrictions on imports into this country of a wide range of goods not involving loss of gold or dollars (*page* 482 *this issue*) comes in a commentary from the National Union of Manufacturers.

" It is assumed," says the NUM, " that the Government will ensure that this action on their part is followed without delay by similar action on the part of the countries concerned.

" Care must be taken to see that there is complete observance of the conditions announced by the President of the Board of Trade that articles must be excluded ' which are not allowed to be sold in the home market or of which production for the home market is subject to very severe restrictions.'

" Assuming that this action by the Government results in greater opportunities for the sale of British goods in these other countries, our productivity must be increased so as to cover:

(1) These increased exports, (2) a reasonable service for the home market, and (3) the three-fold increase of our exports to the dollar countries which is so vitally necessary to fill the dollar gap.

" This increase of productivity can only be secured by still greater efforts on the part of all engaged in industry and by adequate opportunity to industry to maintain and modernise its equipment."

Import Restrictions Relaxed

Chemicals, Oils, Gums and Resins Affected

RELAXation of import licensing restrictions on a wide range of goods was announced in the House of Commons last week by the President of the Board of Trade.

A Government Press note recalls that the British Government took the initiative last July in showing its willingness to assist, as soon as possible, in widening the area of competitive trade within the Organisation for European Economic Co-operation, provided no loss of gold or dollars was involved.

Freeing Trade

The present list of relaxations by the United Kingdom is expected to be followed by reciprocal action by other member countries of the OEEC which were requested to report their proposed measures for trade liberalisation from October 1.

The list of countries to be excepted from the scope of open general licences is as follows:—

The United States and Canada; the Philippines; the dollar account countries of Central and South America (Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Venezuela), Argentina, Uruguay, Japan, Iran, Tangier, French Somali Coast, Liberia, the U.S.S.R., Roumania, Bulgaria, Hungary, Czechoslovakia, Poland, the Russian Zone of Germany, Jugoslavia, Albania and, among the OEEC countries: Belgium and the Belgian Congo, Luxemburg, Switzerland and Western Germany.

Under existing trade and payments arrangements, additional imports from Western Germany would involve an immediate risk of having to make dollar payments to Western Germany.

German goods are therefore excluded for the time being from the scope of the open general licences. Discussions have, however, been initiated with the authorities in Western Germany and H.M. Government hopes that it will be possible very shortly to find a mutually satisfactory basis to provide for a wide increase of trade between the two countries, not subject to Government regulation.

Where tariffs exist to protect home producers, the tariffs are not affected; and where British products are subject to purchase tax the imported goods will also be taxed.

The goods affected by the issue of open general licences are in 16 groups and include the following chemical and pharmaceutical groups:—

Oils, waxes, gums, resins, perfumery materials etc. beeswax; essential oils (natural but not terpeneless): certain floral concretes and absolutes.

Gums and resins: Benjamin (benzoin); copal resin (pontianak or manila); frankincense; karaya; opoponax; yacca. Liquid rosin.

Certain perfumery materials: pine tar; shellax wax; stillingia oil (tallow-seed oil); sugar cane wax; tall oil; tobacco seed oil; tung oil (china wood oil).

Chemicals, drugs, medicines, etc.: Agar agar; ammonium perchlorate; bromine and bromides; camphor, natural.

Carbon blacks: Acetylene black; bone black; drop black; ivory black.

Chromium compounds; citric acid; cobalt sulphate; cochineal; cream of tartar.

Drugs, raw or simply prepared, and the like; drugs, medicines and medicinal preparations, manufactured or prepared; europium compounds; henna leaves; iron oxides, synthetic; lead acetate; lead nitrate; magnesium chloride; monosodium glutanate; nicotine and nicotine sulphate; potassium bromate; potassium chlorate; potassium ferricyanide; potassium ferrocyanide; potassium perchlorate; Prussian blues; pyrethrum flower and extract.

Rootes: Barbasco; derris; lanchocarpus; timbo.

Sodium ferrocyanide; sodium silico-fluoride; squill, red (bulb, powder or extract).

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes, as enumerated in the Board of Trade lists issued under Section I of the Safeguarding of Industries Act, 1921, except: (a) Synthetic organic dyestuffs, colours and colouring matters imported for use as such; (b) Organic intermediate products imported for the manufacture of dyestuffs, colours and colouring matters; and (c) the following chemicals: Acetic anhydride; acid, acetic, glacial; acid, acetic, synthetic; acid, monochlor-acetic; butyl acetate; butyl alcohol; ethyl acetate; ethyl lactate; ethyl silicate; ethylene glycol; glycol esters; glycol ethers; iso-butyl alcohol; lactic acid; triethanolamine.

Tartaric acid; titanium oxide; white lead; whiting.

MACHINERY AND PLANT

Machinery, including parts: Air conditioning machinery, being machinery for cooling, heating, cleaning, circulating, or controlling the humidity of air.

Compressors and exhausters, air and gas; foundry and diecasting machinery; pumps, mechanical, of all kinds, including petrol and oil measuring pumps; rubber and plastic working machinery; water purification and softening (non-domestic) and sewage treatment plant.

ELECTRICAL GOODS

Accumulators, lead-acid and alkaline; batteries, primary; carbons (furnace, lighting and battery); electrodes (carbon and welding); hand lamps, pocket lamps, hand torches and inspection lamps operated by a dry battery, and cases therefor; insulators and other articles of porcelain, earthenware or stoneware; insulating cloth or tape; lamps, filament or discharge (including fluorescent) and parts thereof.

MISCELLANEOUS

Fertilisers: Bone, hoof and horn meal, dried blood, guano.

Fire fighting equipment; linoleum and felt base floorcoverings.

ISRAELI CHEMICALS

U.S. Aids Fertiliser and Acid Project

BY the operations of a new company, Fertilizers and Chemicals, Ltd., recently established near Haifa, Israel will be able to reduce substantially its imports of fertilisers and basic chemicals.

Mr. Robert Szold, chairman of the Palestine Economic Corporation, New York, an American development company operating in Israel, which is a leading advisor and investor in the new Israeli chemical firm, has said that $1.5 million has been invested in the new firm and present expansion plans calling for the addition of a mixed fertiliser plant will require a further $3 million. The plant may be able to supply all the new country's fertiliser needs.

Fertilizers and Chemicals, Ltd., has begun operations with a daily output of 55 tons of superphosphate and 25 tons of sulphuric acid. Raw materials, now imported, should eventually be obtainable from the Dead Sea.

The potassium muriate plant of Palestine Potash, Ltd., at the northern end of the Dead Sea suffered extensive destruction during the Palestine-Arab war and will require considerable repairs, according to a recent report by the United States consulate general at Jerusalem. The firm's plant at the southern end of the Dead Sea escaped damage, but the conflict in 1948 interrupted production.

In 1947 Palestine Potash is said to have set a record for production (123,163 metric tons) and exports (145,510 tons). The United Kingdom has been the principal market for Palestine potash and in 1947 exports to the U.K. totalled 95,977 tons.

CHEMICAL EMPLOYMENT

THERE was a slight increase in the numbers employed in the chemical and allied trades in Great Britain in July compared with the previous month.

Figures published in the current issue of the *Ministry of Lubour Gazette* show sectional distribution as follows:—

Industry	Thousands July, 1949	June 1949	Mid 1948
Coke ovens and by-product works	17.6	17.7	17.3
Chemicals and dyes	196.5	195.6	195.5
Pharmaceutical preparations, etc.	33.6	33.2	30.8
Explosives and fireworks ...	36.1	35.9	33.8
Paint and varnish	38.0	37.8	37.0
Soap, candles, glycerine, etc. ...	48.7	48.4	46.9
Mineral oil refinery	34.8	34.4	30.7
Other oils, greases, glue etc. ...	29.8	29.8	28.9
Total, chemical and allied trades	435.1	432.8	420.9

NEW FLUORINE CHEMICALS

A USEFUL increase in the range and quantity of fluorine chemicals becoming available is anticipated in an announcement this week that the Imperial Smelting Corporation has developed in its laboratories satisfactory methods of producing at its Avonmouth plant benzotrifluoride and fluosulphonic acid. Both are now becoming available in pilot plant quantities. The benzene form, $C_6H_5CF_3$, is a colourless liquid, boiling at 102°C. and freezing at −29°C., having chemical properties which would adapt it for use as an intermediate in the preparation of dyestuffs and pharmaceuticals.

The fluosulphonic acid is a mobile, colourless liquid which fumes in damp air, boils at 162°C. and freezes at −87°C. It lends itself to the preparation of aromatic sulphonyl fluorides, boron trifluoride and acid fluorides and in alkylation and condensation processes.

PACKAGING EXHIBITION

New Materials and Techniques

THE first exhibition to cover every aspect of the packaging industry was opened at the City Hall, Deansgate, Manchester, last Wednesday, by Sir Robert Sinclair, president of the Federation of British Industries.

The display, which has been sponsored by the Institute of Packaging, will give a comprehensive picture of materials and methods including developments resulting from wartime research, and will demonstrate the new protective techniques suited to the needs of the export market.

Exhibitors, who number about 100, include the following firms:—

The Automatic Weighing & Packing Machine Co. (98, New Hall), automatic weighing and packing machines.

British Stoneware Manufacturers' Association (99, New Hall), chemical stoneware.

Croda, Ltd. (101, New Hall), plastics, liquid and solid rust preventatives.

George Driver & Son (83, Tonman Hall), automatic weighing, filling, vibratory conveying equipment.

Goodyear Tyre & Rubber Co. (G.B.), Ltd. (49, Main Hall), Pliofilm packaging.

Imperial Chemical Industries, Ltd. (48, Main Hall), Alkathene packaging.

Shell Chemicals, Ltd. (88, New Hall), shell vapour, phase inhibitor.

Maximum Prices for Fatty Acids

Revised maximum selling prices for certain fatty acids are announced by the Ministry of Food and have now taken effect. Prices, per ton, net, naked, *ex-works*, are: Split linseed oil fatty acid, £144 15s.; white distilled linseed oil fatty acids, £164 5s.; split castor oil fatty acids, firsts, £114 17s. 6d., seconds, £107 7s. 6d.

Ammonium Nitrate Explosions

Basic Factors of the Texas Disaster Reviewed

THE marked differences in susceptibility to ignition of British and U.S. fertilser grades of ammonium nitrate receives fresh emphasis from a comparison of the extensive tests carried out by a British official inestigation group. (THE CHEMICAL AGE, *60*, 784-86 and 821-24) and the complementary investigations in the U.S.A. by the Bureau of Mines (Department of the Interior), whose report has now been published.*

Both were inspired by the recognition of the vast destructive forces which might be released during the commercial handling of tonnage quantities of NH_4NO_3, evidenced by the disastrous explosion of the fertiliser in the French S.S. *Grandcamp* at a railway pier in Texas City on April 16, 1947. (Approximately 600 were killed, 3000 injured and material damage estimated at $58 million resulted from the subsequent train of fire and explosions).

The current American report puts on record the evidence, gathered independently by the Bureau of Mines, of all the main factors concerning the Texas occurrence and of a subsequent series of laboratory experiments to determine the explosive or inflammable characteristics of grades of ammonium nitrate in a pure state and in the presence of oxidising materials. The results of the latter contrast with the general failure in the course of the British experiments to produce a violent reaction by heating or detonating 99.8 per cent ammonium nitrate of fertiliser type.

No Warnings

In a general summary of the material and conditions preceding the explosion the Bureau of Mines report records that the ammonium nitrate, fertiliser grade, was manufactured in War Department Ordnance plants. It contained 95 to 96 per cent ammonium nitrate, the remainder being a wax coating (approximately ¾ per cent) for protection against moisture absorption and kaolin (approximately 3½ per cent) to maintain the free-flowing quality of the materials.

The material was packed in 100-lb., 6 ply, kraft-paper bags, 2 plies of which were asphalt-impregnated. There were no special identifying labels to indicate its oxidising or hazardous properties, as this is not required by Interstate Commerce Commission shipping regulations.

Four samples of the fertiliser were collected during the investigation, said to be of the same grade as the material involved in the explosions on board the ships, and the physical and chemical properties were determined in the Explosives Branch of the Bureau of Mines. The results are given in Table 1, and the report indicates how each sample was obtained, generally from the same or equivalent cargoes in transit.

Material Facts

The physical and chemical properties of these samples were very similar. The moisture content of sample M-8120 was slightly higher than that of the others, probably because of exposure to rain after the explosions. Ultimate analysis of the coating material indicated that it was of a paraffin type, with the exception of sample M-8138, which contained resin. The screen analyses showed that the material was of standard grade and complied with Federal specifications.

To understand the conditions that existed prior to the detonation, Bureau of Mines engineers visited the S.S. *Sweelinck*, a Liberty ship of Dutch registry and almost identical with the S.S. *Grandcamp*.

Before loading begins, the holds are cleaned throughly, and two layers of dunnage are put in place. The dunnage consists of 1-in. boards 5 to 8 in. wide and spaced 2 to 3 in. apart. The layers of dunnage are laid at right angles to each other. The dunnage and the stowage battens on the sides of the ship are covered with heavy paper to prevent the spilled material from coming in contact with the hold of the ship.

The bags of ammonium nitrate are laid flat on the pallets in layers eight bags high, or about 42 in. The stowage battens between the vertical I-beams on the sides of the ship hold the cargo away from the walls and afford an air space between the cargo and the skin of the ship. The bags are loaded in the hold to a depth of 20 to 25 ft.

Of the sequence of events leading to the explosions, the report recalls that at 8 a.m. the day crew of longshoremen arrived aboard the S.S. *Grandcamp* and uncovered and entered hold four to complete loading bags of ammonium nitrate fertiliser, which was begun the previous day.

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* Report of Research and Technologic Work on Explosives, Explosions and Flames: Fiscal Years 1947 and 1948, U.S. Department of the Interior, Bureau of Mines, Washington.

"Jugs of Water"

At 8.10 a.m. smoke was noticed rising between the stowage battens and the inboard " skin " of the ship at the after end of hold four. On removing several bags, a flame was observed 10 to 15 ft. below the top of the cargo. A couple of jugs of water and one 2½-gal. fire extinguisher of soda-acid were applied to the fire.

At 8.20 the longshoremen were ordered out of hold four and hold two and the hatches were closed. Steam was introduced in hold four by the ship's crew. At 8.30 a.m. orders were given to abandon ship. From 8.32 a.m. to 9.12 a.m. fire trucks arrived and firemen laid hose. At 9.12 a.m. the ammonium nitrate in hold four detonated, disintegrating the ship and spraying a wide area with pieces of hot metal and demolishing and setting fire to buildings and other structures. About 5 to 15 seconds later a second explosion is reported to have occurred.

As a result of the explosion on board the S.S. *Grandcamp*, a fire developed in hold one of the S.S. *High Flyer*, containing sulphur, which eventually spread to hold three, containing ammonium nitrate. The sulphur detonated at 1.10 a.m., April 17.

Probable Source of Fire

Although the fire in hold four of the S.S. *Grandcamp* could have been started in many ways, the most probable cause, as brought out by the U.S. Coast Guard investigation, was a burning cigarette or other smoking material discarded carelessly in hold four between the time the hatches were removed at 8 a.m., April 16, and the time the fire was discovered, about 8.10 a.m.

A burning cigarette or other smoking material could have been discarded before the hatches were closed on the afternoon of April 15. The burning material could have ignited paper or other flammable substances, which could have smouldered during the night and burst into flame when the air in the hold was changed by removal of the hatch covers.

Many experiments were carried out to determine whether a burning cigarette or burning tobacco could start burning of the exposed edge of the kraft-paper bagging in contact with a small pile of fertiliser compound. Both positive and negative results were obtained, indicating that a fire in the hold of the ship could have started from this cause.

It was also found that a small quantity of water would easily extinguish a burning mixture of paper and ammonium nitrate from which white and reddish-orange fumes were issuing. Water was also found to stop the reaction in a small amount of heated ammonium nitrate that was giving off dense reddish-orange and yellow fumes. The same was true of a burning mixture of sulphur, paper, and ammonium nitrate.

It is probable that had large quantities of water been introduced into hold four of the S.S. *Grandcamp* immediately after the fire was discovered and before it had spread, the fire could have been extinguished.

Fertiliser Detonated

In preliminary experiments by the Bureau of Mines to determine the explosibility of ammonium nitrate fertiliser it was found possible to detonate, by the application of heat alone and under confinement, 5-lb. charges of the fertiliser that was collected at Texas City.[1] The charges were enclosed in a ¼-in. Shelby seamless tubing 3 in. in diameter and 20 in. long and were heated electrically by wire wound around the tubing. Figures are given to show the experimental apparatus and the fragmentation resulting from the explosion. Many of the fragments show evidence of shear and were blue in colour, similar to fragments collected at Texas City. Further experiments are under way to establish more closely the conditions for detonation.

Conclusions

The exact cause of the fire on the S.S. *High Flyer* is not known; the most probable source of ignition was burning or hot material blown from the S.S. *Grandcamp* or warehouses, which ignited the cargo of bulk sulphur on the S.S. *High Flyer*.

If a "No Smoking" rule had been enforced rigidly on the S.S. *Grandcamp*, the fire that caused the detonation of the ammonium nitrate might not have occurred. It is believed that the fire in hold four of the S.S. *Grandcamp* could have been extinguished if adequate quantities of water had been applied to it soon after the fire was discovered.

Because the paper bags containing the ammonium nitrate fertiliser were not marked so as to indicate the hazardous and oxidising nature of the material, longshoremen and others handling the material considered it to be in the same class as cement. A complete lack of understanding of the hazardous nature of ammonium nitrate fertiliser in the presence of fires and open flames was revealed by all persons who were charged with handling, transporting, and stowing this material.

Properties and Hazards

To help in assessing the conditions surrounding the explosions the report reviews some of the more important properties of ammonium nitrate and summarises its known fire and explosion hazards.[2]

In view of the marked differences, in regard to susceptibility to ignition or explosion of American and British grades of ammonium nitrate fertiliser, the report's description of methods of preparing the U.S. material is of interest.

The process given refers particularly to the type of fertiliser involved in the Texas City and Brest disasters:—

Method of Production

Starting with ammonium nitrate liquor of about 80 per cent strength, the crystals are dissolved by steam. The warm liquor is then filtered and transferred to the hi-pans, which are open, steam-heated, evaporating pans with air agitation. When the "fudge" point (310°F.) is reached, the nitrate is transferred to the graining kettles, where it is cooled while being mechanically agitated. When granulation reaches a certain point, coating material is added, and stirring is continued until the coating is uniform. The material larger than 8-mesh is then screened out, and the material smaller than 8-mesh is bagged in 6-ply, moistureproof, paper bags at a temperature not exceeding 200°F.

The finished fertiliser is required to meet the following specifications:—

	per cent
Moisture	0.25 max.
Ether-soluble material (saturated white paraffin wax)	0.75±0.35
Water-insoluble material (kieselguhr)	3.50±1.00

Specifications for granulation are:

	per cent
Through U.S. Standard No. 8 sieve	100
On U.S. Standard No. 35 sieve	55
Through U.S. Standard No. 100 sieve	8

The Bureau of Mines report goes on to summarise the relevant data relating to the physical properties of ammonium nitrate, quoting appropriate authorities. In regard to chemical properties, it reproduces Berthelot's[3] tabulated record of decomposition rates:—

(1) $NH_4NO_3 = HNO_3 + NH_3$ (absorbs 41,730 calories).

(2) $NH_4NO_3 = N_2 + 1/2\ O_2 + 2\ H_2O$ (liberates 28,470 calories).

(3) $NH_4NO_3 = N_2O + 2\ H_2O$ (liberates 8820 calories).

(4) $NH_4NO_3 = 1/2\ N_2 + NO + 2\ H_2O$ (liberates 6870 calories).

(5) $3\ NH_4NO_3 = 2\ N_2 + N_2O_3 + 6\ H_2O$ (liberates 65,420 calories).

(6) $2\ NH_4NO_3 = 1\text{-}1/2\ N_2 + NO_2 + 4\ H_2O$ (liberates 48,910 calories).

(7) $5\ NH_4NO_3 = 2\ HNO_3 + 4\ N_2 + 9\ H_2O$ (liberates 153,360 calories).

The energies are calculated from the data of Bichowsky and Rossini,[4] the nitrate being in the solid state and the products in the gaseous state at constant pressure and 18°C.

Free Energy Factor

The reactions take place at different temperature levels beginning at somewhat above 100°C. The last three reactions are highly exothermic, and it is presumed that these take place at or above 260°C., where the decomposition of ammonium nitrate has been observed to proceed explosively. A bureau report (Scott, G. S.) gives the detailed literature on this subject.

Lewis and Randall[5] stated: "It is true we do not recognise as explosives all substances whose decomposition would be attended by large negative values of ΔF (free energy) and ΔH (heat of reaction). Nevertheless, they belong at least potentially to this class." Accordingly, calculations of free energies will indicate whether or not ammonium nitrate may be classified as a potential explosive. The system of Lewis and Randall was used in the following calculations.

The Bureau's report presents a plot of free energies versus temperature for a number of decomposition reactions involving ammonium nitrate. This goes to show that the salt is stable up to about 320°C. with respect to its elements and also with respect to its dissociation into ammonia and nitric acid. It is not stable, however, with respect to the various decompositions accomplished by the formation of water.

If, therefore, the decomposition of ammonium nitrate follows any of these latter reactions, it could conceivably become explosive. As the various oxides of nitrogen are unstable, it follows that the largest free-energy decrease occurs for decomposition into water, nitrogen, and oxygen. When carbonaceous matter is present and reacts with the liberated oxygen, a still greater free-energy decrease takes place.

Impurities and Decomposition

According to the literature, fused ammonium nitrate reacts with aluminium, zinc, lead, antimony, bismuth, nickel, copper, silver, and cadmium, but not with arsenic, tin, iron, or mercury. Zinc is attacked very rapidly and can lead to violent explosions. Copper is said to produce nitrite and thereby increase the explosibility. Many chromium compounds catalyse the decomposition of ammonium nitrate; also, the presence of cellulose is said to promote decomposition.

Ammonium nitrate, like sodium nitrate, potassium nitrate, and other nitrates, is an energetic oxidising agent containing 20 per cent of its weight as available oxygen when decomposed according to the equation

$$NH_4NO_3 = N_2 + 2\ H_2O + 1/2\ O_2.$$

Organic or other easily oxidisable matter in contact with ammonium nitrate produces violent combustion on ignition. Various metals react with ammonium nitrate at elevated temperatures and some at ordinary temperatures, especially zinc.

Hardesty and Davis[6] have shown that in the presence of any material that can cause ammonium nitrate to set free nitric acid the following reactions with carbonaceous material are possible:

$$2\ HNO_3 + C = CO_2 + H_2O + NO_2 + NO$$
$$2\ NO_2 + 2\ NO + 3\ C = 3\ CO_2 + 2\ N_2$$

The above reactions can take place in the presence of peanut-hull meal, cotton-seed meal, soybean meal, lignin, cocoa-shell meal, lignite, dried peat, sawdust, ground cord, ground kraft paper, ground burlap, castor pomace, millet seed, oak-heart wood, brown rotted wood, cane sugar, dextrose, and cornstarch.

In the oxidation of organic matter, metal powders, etc., by the ammonium nitrate the presence of air is not necessary, as the oxygen can be furnished by the ammonium nitrate. Thus, an ammonium nitrate fire cannot be extinguished by smothering, such as flooding with steam.

Spontaneous Heating

As far as is known, there is no recorded instance of spontaneous heating in pure ammonium nitrate. However, in the presence of foreign material, spontaneous heating may take place, depending on conditions such as quantity, temperature, insulating properties, nature of the foreign material, etc.

A study in which a large quantity of ammonium nitrate fertiliser was exposed to temperatures ranging from 72° to 100°F. was made by Bureau of Mines engineers. This was carried out on shipboard during loading and in transit across the Gulf of Mexico and the Caribbean Sea to the Canal Zone.

Data collected showed no self-heating in the 8500-ton cargo during the nine days of loading or five days in transit. Information was received later from an Asiatic port stating that the cargo had reached its destination at essentially the temperature recorded at the termination of the tests.

Easily oxidisable metal powders in contact with wet ammonium nitrate may heat spontaneously.

Detonation

Ammonium nitrate has been reported to have rates of detonation ranging from as low as 1000 to as high as 2700 metres per second, depending on conditions (Table 2). The more important of these contributing factors are confinement, pressure, charge diameter, strength of initiating impulse (that is, the nature and quantity of booster), packing density, particle size (especially at low packing densities), temperature, and the presence of small amounts of certain contaminants. (*See Table* 2.)

The detonation rate decreases with decrease in tube diameter.

Kast[11] postulated that ammonium nitrate did not ordinarily develop its full inherent explosive power and that the limiting value of the detonation rate was seldom reached in the testing methods used. He gave the following calculated values to represent incomplete and complete detonation of ammonium nitrate:

	For incomplete detonation	For complete detonation
Detonation rate, metres per second	1500	3000
Gas volume for 1 kilogram, litres	945	980

The Bureau of Mines appends the following summary, based upon the foregoing experimental observations by different investigators and upon their conclusions.

1. Chemically pure ammonium nitrate does not decompose spontaneously at ordinary temperatures.

2. It is an oxidising agent and, as such, may react with reducing materials such as carbonaceous matter, certain metals, phosphorus, sulphur, etc. Such mixtures may lead to spontaneous heating, and the temperature at which this may take place is governed by the specific materials concerned and their environment. With certain mixtures and the proper environment, spontaneous heating may occur at ordinary temperatures.

(*continued on page* 490)

BASIC PROPERTIES AND DETONATION RATES

TABLE 1.—PHYSICAL AND CHEMICAL PROPERTIES

Sample No.	M-8120	M-8136	M-8137	M-8138
Source	Unknown	Iowa Ordnance Plant	Cornhusker Ordnance Plant	Nebraska Ordnance Plant
Sample obtained from	Pier O, Texas City, Tex.	Car IC-15181 Galveston, Tex.	Pier 38A Galveston, Tex.	Car PM-89262 Texas City, Tex.
	Chemical analysis, per cent			
Moisture	0.18	0.05	0.09	0.02
Ammonium nitrate[1]	94.85	96.08	95.73	95.92
Coating	81	74	.73	[2].88
Kaolin	4.16	3.13	3.45	3.18
Ultimate analysis of coating material:				
Carbon	84.80	84.16	83.70	78.40
Hydrogen	14.06	13.90	13.88	10.42
	Screen analysis, U.S. standard screens			
Retained on No. 8 screen	0.00	0.00	0.00	0.00
Passed through:				
8 on 35	91.55	86.75	97.00	84.50
35 on 100	8.05	12.50	2.50	14.75
100 on 200	.05	.35	.25	.25
200	.35	.40	.25	.50
[1] Includes ammonium nitrate	.00124	.00184	.00194	.00112

[2] Coating contains resin.

TABLE 2.—DETONATION RATES OF AMMONIUM NITRATE AND AMMONIUM NITRATE FERTILISER

Rate	Density	Diameter of charge	Container	Method of Initiation	Remarks	Reference
m./s.	g./cc.			Ammonium Nitrate		
1,270	—	40 mm.	Steel tube, wall thickness not given	5 No. 8 detonators	—	Aufschlager[7]
2,440	—	50 mm.	Lead tube, wall thickness not given	Compressed picric acid	—	,,
1,000	0.71	1-1/32 in.	Shelby steel tube: 1-1/32 in. i.d., 1-1/2 in. o.d.	No. 8 det. with various boosters (picric acid, tetryl, TNT, amatol	15° C.	Gawthrop[8]
1,700	0.71	1-1/32 in.	,,	,,	140° C.	,,
1,400 to 1,500	1.0	7.2 to 8mm.	Tubes	Nitrate mixed with 1.5-2% MgA. di and tritretronaphthalenes, TNT. Rate of pure ammonium nitrate found by extrapolation	—	Laffitt[9]
1,850	0.82	1-1/32	Shelby steel tube, wall thickness, 3/16 in.	No. 8 det. plus 100 g. tetryl	Pure nitrate	Perrott[10]
1,940	0.82	1-1/32	,,	,,	1% nitrostarch	,,
2,060	0.82	1-1/32	,,	,,	5% nitrostarch	,
2,470	0.82	1-1/32	,,	,,	10% nitrostarch	,,
1,460	0.83	2.5 cm.	Seamless steel tube	50 gm. pressed tetryl	—	Kast[11]
1,310	0.84	2.5 cm.	,,	,,	—	,,
1,470	0.83	2.6 cm.	,,	60 gm. pressed tetryl	—	,,
1,230	0.69	5 cm.	,,	100 gm. pressed picric acid	—	,,
1,280	0.65	5 cm.	,,	,,	—	,,
1,490	0.68	8 cm.	,,	300 gm. pressed picric acid	—	,,
1,500	0.66	8 cm.	,,	,,	—	,,
1,530	0.79	8 cm.	Seamless steel tube	100 gm. pressed picric acid	—	,,
1,550	0.88	8 cm.	,,	,,	—	,,
2,700	0.98	8 cm.	,,	250 gm. pressed tetryl	—	,,
1,920	0.64	10 cm.	,,	100 gm. pressed picric acid	—	,,
1,820	0.84	10 cm.	,,	200 gm. pressed tetryl ammonium nitrate fertiliser	—	,,
1,106	0.90	4-1/2 in.	Unconfined	1/2 lb. Comp. C.	Length of column, 48 in.	Macy[12]
1,350	0.91	1-1/4 in.	Seamless steel tubing, 1/4 in. wall thickness	Blasting cap and 50 g. Comp. A-3 (U.S. Eng. Special)	Length of column 51 in.	,,
2,109	1.4	3 cm.	Molten (above 169° C.)	,,	Length of column, 44 cm.	,,

3. The quantity of ammonium nitrate that can be detonated by initiation depends on the geometry, confinement, temperature, packing density, nature and quantities of any impurities present, and strength of the booster charge.

4. It is considered very difficult to detonate by ordinary impact or friction, although some experimental results appear to be at variance with others.

5. When heated unconfined, it merely effervesces and leaves little, if any, residue.

6. When heated under confinement or partial confinement, it may explode. The temperature at which explosion occurs is affected by a number of factors, such as the container, heating rate, and impurities present. For pure ammonium nitrate, temperatures from 300° to 350° C. have been variously reported. The temperature is lowered by the presence of certain impurities. Pressures necessary for explosion have not been determined.

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Two Emissaries to Study U.S. Production Methods

APPROVAL has been given to an ECA technical assistance project providing for a study of American methods by Dr. Alexander King, secretary of the U.K. Government Committee on Industrial Productivity.

This provides for a one-month visit to the U.S.A. by Dr. King, who is already in Washington, D.C., after attending the United Nations Scientific Conference on Conservation and Utilisation of Resources. Dr. King is Chief Scientific Liaison Officer of the Office of the Lord President of the Council.

At the same time ECA approved a technical assistance project providing for a one-month visit in the U.S.A. by Mr. Winston Rodgers, head of the Methods Engineering Department of Acton Technical College. Mr. Rodgers, who will observe time and motion study techniques at U.S. universities and research laboratories, during this month.

Dr. King is conferring with U.S. Government officials and engineers on a five-point programme:

(1) To arrange for closer collaboration between the U.S. Bureau of Labour Statistics and Great Britain's Department of Scientific and Industrial Research (DSIR) on methods of measuring industrial productivity.

(2) To consult with graduate engineering school officials on the best methods of revising engineering education in the United Kingdom.

(3) To strengthen the exchange of technological information between the DSIR and other British agencies and the U.S. Department of Commerce's Office of Technical Services.

(4) To consult with U.S. scientists and industrialists on new methods of manufacturing nitrogen and phosphate fertilisers required in the United Kindom.

(5) To consult with ECA, the Department of State and other U.S. Government agencies on the British Government's scientific and technological policy, particularly as it relates to the problem of industrial productivity.

Dr. King is chairman of the United Kingdom Committee on Overseas Scientific Relations and was recently named head of the OEEC group working on the interchange of technology among Marshall Plan countries.

Prices of Oils and Fats

No change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the five-week period ending November 5, 1949—announces the Ministry of Food.

A NEW COKING PROCESS

Norwegian Electrical Development

A NEW electrical process for producing high-grade coke from the Norwegian coal on Spitsbergen is reported by the Royal Norwegian Information Service. The process has been devised by the large chemical concern, Norsk Hydro, in collaboration with the Norwegian authorities.

Hitherto, it had seemed impossible to exploit fully the estimated 8000 million tons of coal on Spitsbergen. The arctic mines have a temperature slightly below freezing, and the coal disintegrates when thawed, making it unsuitable for firing or coking by traditional methods.

Now two new methods have been discovered to overcome this difficulty. One is to crush the coal to a fine powder and then make it into briquettes under heavy pressure. The other method is to bind the coal together by means of concentrated sulphite-lye from the cellulose factories. The latter method has the advantage that the coal need not be crushed so finely, and consequently pressing machines of simpler construction can be used.

It is now possible to produce high-temperature coke which is very strong and far more reactive than ordinary high-temperature coke. It can be used with great advantage both as a reducing material in all kinds of metallurgical processes and as a smokeless fuel for domestic heating. The by-products of coking tar and gas—are both readily usable in Norwegian industry, and gas can be used for chemical syntheses, especially of motor-fuel.

Valuable Yield

It is estimated that a plant processing 1.5 million tons of coal can produce 700,000 tons of ash-less coke briquettes, 130,000 tons of low-temperature tar, and 70 million gallons of petrol plus diesel oil. This would require 300,000 kW of power a year.

A plant of this size would be able to meet Norway's requirements of coke and floating motor-fuel, besides giving valuable raw materials for the chemical industry. The price of the home-produced petrol would be about twice the present import-price (but only 10 per cent more in actual retail price), but, as the cost of imported petrol is expected to rise steadily, the difference would eventually be eliminated.

OIL FROM COAL

Economies from the "Fluidised Bed"

THE cost of making synthetic petroleum and oil from coal may be significantly reduced by a new method described by five U.S. Bureau of Mines chemists at the national meeting, last week, of the American Chemical Society. It eliminates part of the complicated Bergius-I.G. process and is the method which is under investigation at the Bureau's Synthetic Liquid Fuels Laboratories at Bruceton, Pennsylvania. It was described by E. L. Clark, M. G. Pelipetz, H. H. Storch, S. Weller, and S. Schreiber.

Preliminary work at the Bruceton laboratories, it was reported, has shown that the hydrogenation of coal can be effected without suspending the coal particles in oil. This eliminates the need to prepare oil for use, and to separate the oil from the resulting mixture, and the space formerly occupied by the oil becomes available for the conversion of more coal.

No Pressure Problems

The improved process, it is claimed, requires only operating equipment and techniques already familiar to the American petroleum industry, so that no heavy, specially designed and expensive equipment is necessary, such as that required to withstand the high pressures used in the Bergius process.

Hydrogenation is accomplished in the new process by blowing hydrogen gas through a bed of coal particles—the "fluidised bed"—which permits the chemical addition of hydrogen to coal at much lower pressures than those demanded by the Bergius process.

Some of the coal is not converted to oil and petroleum, but instead releases hydrogen and other gases and becomes char or coke. This is advantageous, for several reasons.

The hydrogen released is immediately available for further reaction with other unreacted coal. This means that less hydrogen gas has to be compressed and supplied and effects a considerable saving. The coke itself provides an ideal fuel to supply the power requirements and the original coal loses practically all its sulphur so that the coke is particularly valuable.

There remains the problem of injecting dry particles into a system under pressure—a severe one. The Bruceton laboratories are approaching the solution of this and similar problems.

Competitive Characteristics of Titanium

Opportunities for Scientific Development

MORE than a hundred potential applications of the metal titanium, in industry, the home and for defence, were cited by Dr. C. C. Ralston, chief metallurgist, and Dr. F. J. Cservenyak, of the U.S. Bureau of Mines, in a paper presented at the recent 116th national meeting of the American Chemical Society, at Atlantic City.

Although the metal is too difficult to refine to compete in price with aluminium, copper, and steel, its unusual strength, lightness, and defiance of corrosion are invitations to enterprising scientists and engineers, the speakers said.

Since titanium was believed to be the fourth most plentiful metallic element in the earth's crust—outranked only by aluminium, iron, and magnesium—there would be no lack of natural resources.

Heat and Corrosion Resistance

One of the metal's most obvious potential uses was in aircraft, where it should partially replace high-strength light alloys of magnesium and aluminium. While the latter two metals began to weaken as the temperature rose above 300°F., titanium retained its strength. The metal's resistance to corrosion had also an important bearing for shipping uses.

Corrosion tests on titanium in sea water had shown scarcely any effect on the metal and indicated that it was more resistant to salines than any common engineering material. Because titanium resisted a wide range of corrosive agents it could be used for food handling and processing equipment in restaurants and processing plants, and its inertness to strong acids and alkalis made it suitable for chemical plants.

Increasing production of titanium was disclosed by the E. I. Du Pont de Nemours Company in a paper prepared by E. A. Gee, J. B. Sutton, and W. J. Barth, all of that firm. The first small-scale commercial production of the metal was announced by Du Pont a year ago. Plant capacity was 100 lb. a day. Large increases had since been made.

To-day the prospects for a large-scale titanium industry were especially promising. Du Pont's future plans depended upon the uses developed for it by the metals industry and the volume for which there would be a market. It might be several years before those factors were known. Production was now consistent and quality had been improved during the year, while engineering improvements had also been made.

First ingots weighed 10 lb., but a later method permitted the production of 100 lb. and finally 400 lb. ingots.

The paper dealt primarily with the results of research into the effect of carbon in the metal. The conclusion was that, above 0.25 per cent carbon content in titanium, increasing amounts of carbon did not appreciably affect strength, but decreased its ductility slightly. It was from this and other research work, the chemists were told, that future uses of the metal would be developed.

Meanwhile, in New York the Allegheny-Ludlum Steel Corporation—believed to be the only steel company producing pure titanium, and the second most active company experimenting with the metal—would not hazard a guess as to when full commercial production would be feasible. They still had problems of perfecting processes and reducing production costs, a spokesman said. Prices had been running between $5 and $10 a lb.

ECA Grants to U.K.

TOBACCO, petrol and aluminium made up the bulk of the Marshall Aid grants issued to the United Kingdom in August, the Economic Co-operation Administration Mission to the United Kingdom reported on September 29.

Of the $65.5 million worth of procurement authorisations issued to the United Kingdom last month, $20.2 million was for tobacco, $20 million for petroleum or petroleum products and $14 million for aluminium. Virtually all the raw aluminium imported into the United Kingdom is provided by Marshall Aid. The other major ECA grant to Britain in August was an authorisation of $6.3 million for copper.

The August procurement authorisations brought the total provided by ECA to the United Kingdom since the beginning of the European Recovery Programme in April, 1948, to $1,725,600,000.

It was announced this week that ECA is to provide $22,500 for technological books and publications for the use of DSIR and affiliated research organisations.

CHEMICAL ENGINEER IN FOOD INDUSTRY

Waste Reduction and Disposal

EXACTING requirements, especially of the food processing industries, present great scope and responsibilities for the chemical engineer. In the U.S.A. and Canada, as here, many more are needed than are available. This was evidenced by speakers at the recent symposium, in Montreal, on industries, held by the American Institute of Chemical Engineers.

"Process engineers are the key men of a chemical engineering organisation," said Mr. F. S. McCarthy, of Canadian Industries, Ltd., "and full responsibility for carrying out and co-ordinating all work on any particular project is in their hands." But such men were scarce in Canada, he said, so scarce, it was now believed that incoming graduates must be selected shortly after their preliminary training, earmarked for the chemical engineering group, and assigned for four or five years to production work for the necessary background of training.

Educational requirements necessary to develop trained chemical engineers for their important duties in the food industries were described by J. H. Rushton and M. E. Parker, of the Illinois Institute of Technology. A knowledge of biology, biochemistry and bacteriology, as well as the standard chemical engineering subjects, was essential for a career in food engineering. A curriculum designed with that end in view had been recently developed at the institute with which they were connected for undergraduate and graduate students. Research on subjects of interest to the food industries was in progress.

Essential Control

In a paper on "Waste Disposal in the Food Industries," Mr. Horace Hinds, Jr., of the chemical division of Corn Products Refining Co., Argo, Illinois, said, because further growth of populations and industry would create additional wastes, the chemical engineer held a key position in society's development. He was most often interested where wastes were dumped into streams which already received materials to an extent that brought them close to undesirable pollution levels. For new plants the chemical engineer must plan to control wastes and their disposal so that nuisances were avoided at all times.

In the food industries, continued Mr. Hinds, Jr., the chemical engineer was usually responsible for waste reduction and disposal and he must find suitable methods at costs that could be tolerated. Costs were the key to the selection of methods. The output of a factory was critical in most food industries if any profit was made; so process rate was important and the volume rate of waste would affect disposal costs which must be held to very low levels.

Variety in Wastes

The chemical engineer would balance his books the same as an auditor did; inputs, or debits, must balance the outputs, or credits. He would find some plants could process their own wastes; some could separate wastes into material possibly requiring no treatment; requiring simple treatment at the factory; or possibly some that required special treatments which might be applied at the factory or at a municipal disposal plant. Quantities must be exact, their variations must be known, and the nature of the waste must be carefully determined. Some material, of course, might be converted to by-products, but the chemical engineer must be cautious to prevent the happy thought from becoming a dream and turning into a financial nightmare.

Ultimately, the portion a municipal sewage plant could handle best might be sent to them and process costs might be shared. Industrial vigour and community progress could be accomplished by cooperation to make it profitable for industry to operate in a particular area and provide increased productivity for people living among good surroundings.

Briefly, the chemical engineer in the food industry must be close to management to assist adequately with waste control and disposal through the careful consideration and process balance that was required. Process quantities, as well as technicalities and costs, must be related to costs and methods of disposal in a complex system of balanced quantities, practices, and expenses. He might also act as advisor, supervisor, or policeman as the individual plant might require to accomplish housekeeping and maintenance practices that prevented spoilage and spills. He must lead and obtain co-operation all the way from management levels to the cleaners and mechanics, with whom he must work directly successfully to keep wastes at a minimum.

PREVENTING CORROSION

Dye Control of Sulphate-Reducing Bacteria

SOME fresh light on the modern capacity for minimising corrosion effects resulting from hydogen sulphide produced by anaerobic bacteria has been provided by T. Howard Rogers, D.I.C., A.I.M., of the British Non-Ferrous metals Research Association, in the course of a selective study of the rôle of biologically produced sulphur compounds in metal corrosion.

In the course of this full length review, published by *British Science News* (Vol. 2, 23, 322-326), the research association's biologist and corrosion investigator indicates that, while control of the distinctive results of bacteria-produced hydrogen sulphide is not generally practicable in open systems (ships' condensers, etc.). protection can now be secured in many closed systems containing limited quantities of water.

The problem of inhibiting the growth of sulphate-reducing bacteria causing corrosion—writes Dr. Rogers—is not a simple one of disinfection and there is the possibility that the disinfectant chosen may itself have corrosive properties.

The use of chlorine in various dosages is popular in power plant operation but it has been found that the sulphate-reducing organisms are resistant to chlorine except in rather high concentrations.

Effective Inhibitor

When a survey was made of the substances which might fill the special requirements of the problem, consideration was given to dyestuffs which were likely to be non-corrosive and possibly effective in very small concentrations. Tests on the resistance of mixed cultures of sulphate-reducing bacteria to a large variety of dyestuffs, showed that dyes of the flavine type are very effective.

The assistance of Imperial Chemical Industries, Ltd., was sought and they prepared some derivatives of 3: 6-diamino-acridine of which the dye now known as "I.C.I.914" had proved extremely efficacious for the inhibition of such bacteria. Some experiments to estimate the concentration of dye required to inhibit the growth of sulphate-reducing bacteria in varying degrees of infection have been conducted.

Bottles containing 75 cu, cm. of van Delden's (1904) medium inoculated with a known number of bacteria, containing dye concentrations varying from 1 part in 250,000 to 1 part in 3 million were incubated and the type of result obtained summarised (*see Table*), a plus sign indicating growth and a minus sign indicating no growth.

Concentration of dye	Estimated numbers of bacteria per cu cm in bottle of 75 cu cm 2 100	1,050	210	21	2·1	0 21
1 / 250 000	+−−	A−−−	−−−	−−−	−−−	−−−
1 / 500,000	+−−	−−−	−−−	−−−	−−−	−−−
1 / 750,000	+−−	−−−	+−+	−−−	−−−	−−−
1 / 1,000,000	−−−	+++	−+−	−−−	−−−	−−−
1 / 2,000,000	C+++	+++	−+−	−+−	−−−	+−−B
1 / 3,000,000	+++	+++	+++	−+−	−−−	+−−
Nil (controls)	+++	+++	+++	+++	+++	+++D

A line AB, above which all cultures are negative, and another line CD, below which all cultures are positive, can be drawn across the table. The variation in the slope of the lines shows that the dye concentration necessary for inhibition is dependent upon the degree of infection.

It is considered that line AB indicates the amount of dye necessary to prevent the growth of known numbers of sulphate-reducing bacteria when samples are tested under optimum conditions of growth.

The experiment was repeated several times, and allowing for normal biological variation, the lines AB and CD fell in approximately the same position in each case. The zone between the lines AB and CD which contains cultures showing both positive and negative reactions indicates that there are dye concentrations which may or may not inhibit certain degrees of infection.

It is well known that bacteria show marked variation in their response to diverse conditions, so the existence of the area ABCD is to be expected. Practical use of the dye has now shown that 1 lb. of dye per 100 tons of water is usually sufficient to control anything but the grossest infections if used on successive occasions, the number of dosages being a function of the degree of infection. As a result of this work a patent application has been granted for the use of certain dyestuffs as inhibitors of sulphate-reducing bacteria. (Brit. Pat. Spec. Nos. 497, 829; 1938.)

SPANISH PRODUCTION AND RESEARCH

Leadership of Vizcaya in Chemical Advances

VIZCAYA is well known as one of the leading industrial centres of Spain, especially in the chemical field. At a recent conference in Bilbao, I. Zumarraga gave an interesting account of the historical rise and progress of chemical industries in Vizcaya (*DYNA*, 1949, *24*, 315-322).

As an industrial chemical centre, Vizcaya probably dates back to 1775, when the Royal Society of Vascongada (and Friends of Peace) established a chair of chemistry in the Patriot School of Vergara.

One of the oldest industrial companies in the province was Soc. An. de la Dinamita, of Bilbao, founded about 1872, which began with nitro-glycerine and subsequently expanded into other chemical manufactures such as hydrochloric acid, ferrous and copper sulphates, etc. It afterwards formed part of the larger combine, Union Española de Explosivos, formed in 1896 with capital of 25 million pesetas. Another large concern, apparently independent of the Union, was the Fabrica de Explosivos de Galdácano, which also branched into many other fields of chemical industry.

Fertiliser Output Impaired

The production of superphosphates in Spain began about 1914, when the Union built a factory at Luchana. This now has an annual capacity of 30,000 tons of sulphuric acid, 72,000 tons of superphosphates, and 30,000 tons of mixed fertilisers. The total Spanish capacity for superphosphates reached a maximum of 1.16 million tons in 1928, requiring 600,000 tons of imported phosphorite. These figures, however, have since suffered serious decline, to 365,000 tons of superphosphates in 1947, and 707,000 tons in 1948, or about 70 per cent of total capacity. Investigations by the National Institute of Industry in regard to deposits of natural phosphates in the Spanish Sahara will, it is hoped, eventually assist in further developments.

Another acid and phosphate factory is that of Llano y Escudero, S.A., with an annual production of 17,000 tons of sulphuric acid and 24,000 tons of superphosphates. Thus, the total capacity for superphosphates in Vizcaya is about 100,000 tons, or one-tenth of the national total.

In general synthetics and chemicals, a leading Spanish company, located in Vizcaya, is the Union Quimica del Norte, S.A., with present capital of 150 million pesetas. This firm has enlarged its old factory at Baracaldo and built a new one at Axpe, manufacturing zinc oxide and chloride and ammonium salts, also lithopone. It produces various synthetics from water gas or the CO_2/H_2 mixture, including methanol and other alcohols, in a high pressure plant (325 atmospheres). In 1945 and subsequently, phenol and phenolic resins were produced, together with many related products.

Essentials

At the end of last year a new plant was installed for the production of 18,000 tons per annum of contact sulphuric acid. Another factory is now nearing completion at Metaporquera (Santander) for the manufacture of calcium cyanamide (10,000 tons per annum), and a third is contemplated for titanium dioxide pigment, for which Spanish deposits of ilmenite would be utilised. Other products of the Spanish chemical industry are calcium carbide, acetylene and its many derivatives, and vinyl plastics.

The importance of synthetic nitrogen products has long been realised in Spain, which is demonstrated by the decree to establish the industry, dated February 10, 1940, but very little of a practical nature has yet been done. Only about 20,000 tons of ammonium sulphate were produced in 1940, and to-day the output in Vizcaya is barely 5000 tons. Steps are being taken, in conjunction with the National Institute of Industry, however, to increase production by the establishment of factories in Escatron and other places for the manufacture of nitrogen products, lubricants, and fuels, as well as a large plant by the Soc. Iberica de Nitrogeno with a capacity of 230,000 tons of ammonium sulphate and 66,000 tons of nitrate.

In Vizcaya two other companies have been formed: La Soc. Espan. de Fabricaciones Nitrogenadas, and Nitratos de Castilla, with a total capacity of 125,000 tons of ammonium sulphate and 65,000 tons of nitrate annually.

In collaboration with the A.H.V. (Altos Hornos Vizcaya), the first of these, the SEFANITRO concern, was established in 1941 with a capital of 150 million pesetas. Agreements were made with the German

I.G. Farbenindustrie and other firms for an extensive manufacturing programme, but difficulties due to the war prevented much progress. Some help, however, has been forthcoming from the Swiss firm of Krebs (Zurich), and it is hoped by next year to have at least half the original programme under way, and to be in full working order by 1951, including a large plant for the production of hydrogen and nitrogen, sulphuric acid, etc.

Ammonium Nitrate

The second Vizcayan company, Nitratos de Castilla, although it has its headquarters in Valladolid, owes much to Vizcayan initiative and collaboration. It was also established in 1941, entered into agreements with German firms, and suffered many setbacks through the war. It, too, received support from Switzerland, notably from the Soc. Hidro-Nitro of Geneva. It is expected that by the autumn of this year the installation of plant will be sufficiently advanced to permit an extensive production programme being put into effect. Hydrogen is being produced by electrolysis in a 22,000 kW plant, and nitrogen by air fractionation. A Haber-Bosch plant will be used for ammonia synthesis, part of the output being utilised for nitric acid by the Bamag-Meguin method. The output of concentrated ammonium nitrate will be about 32,000 tons per annum.

Other chemical firms in Vizcaya include Soc. Electroquimica Española, which is one of the leading Spanish firms in the electrochemical industry, established in 1942 with capital of 15 million pesetas and now producing caustic soda, chlorine, calcium chloride, hydrochloric acid and hydrogen; Empresa Minerales y Productos Derivados, S.A., manufacturing, *inter alia*, hydrofluoric acid at Lamiaco to the extent of five tons a day. A pilot plant is included for experimental work on fluorides and other derivatives, Freon catalysts, etc.

Empresa General Quimica, S.A., was formed in Bilbao in 1949, with initial capital of 60 million pesetas, and is really a joint subsidiary of A.H.V., S.E.F.A. Nitro and others, for the production of chemicals somewhat outside the scope of the parent companies, such as cyanide, not hitherto made in Spain, and rubber-making chemicals.

New chemical factories are being erected in Alava. Yet another new company is Soc. Productos Quimicos de Luchana, making phthalic anhydride, etc., as a basis for plasticisers, glycero-phthalates and other important products in the Spanish national economy.

Several other branches of the chemical industry are being established in Vizcaya, and are grouped under the Industrial Chemistry Syndicate. Among these are Firestone Hispana, S.A.; Soc. Iberica de Gomas y Amiantos; glass works (Fab. de Vidrios de Lamiaco and Vidriera de Llodio S.A.); soap factories (Tapia y Compañia S.A., Jabonera Bilbaina, S.A., together making 20,000 tons per annum, or 11 per cent of the Spanish total); paint factories numbering about 18 in Vizcaya. In all, this group comprises some 200 chemical companies with an aggregate capital of more than 1200 million pesetas.

At a conference held in Rome this year by the C.N.R. (Consiglio Naz. delle Ricerche) a paper was read by Señor Martin Almagro on the organisation of scientific research in Spain, and more specifically the work of the Consejo Superior de Investigaciones Cientificas, established early in 1939. The purpose and functions of the latter were set forth in a special decree dated November 24, 1939, and cover a wide field in all branches of science, jurisprudence, history, sociology, etc. (*La Ricerca Scientif.*, 1949, *19*, (7), 629-644).

A large part of the work of the consejo is decentralised and distributed through several patronatos or technical groups, each of which, with a considerable degree of independence and responsibility, may control several scientific institutes, technical colleges and the like.

Grouped Research

Theoretically, to each patronato belongs one science or group of sciences and industries based thereon. Although this presents some difficulties as to precise division, these have now been fairly satisfactorily overcome. The patronato "Alonso de Herrera" is concerned chiefly with applied biological science, and controls several institutes. A third group of patronatos comprises the physical, chemical and mathematical sciences. For example, the "Alonso Barba" controls chemical research, and the "Antonio de Gregorio Rocaselano" is in charge of physical chemistry.

One special purpose of the consejo is to establish panels of scientific officers, senior and junior, somewhat after the pattern of the Barlow Committee in this country, to which reference is made by Almagro. It is gradually building up a reserve fund for research, from government grants and fees payable, and some details are given as to general financing in the various groups.

Recording Progress in Atomisation

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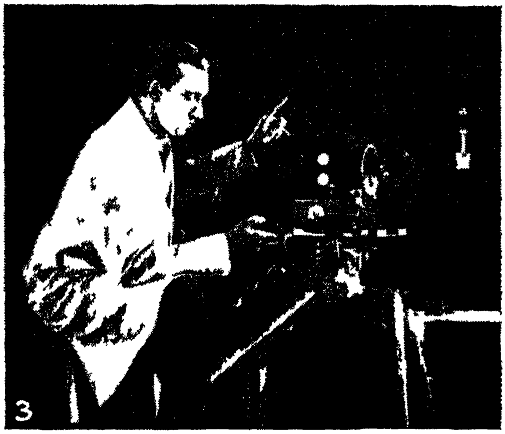
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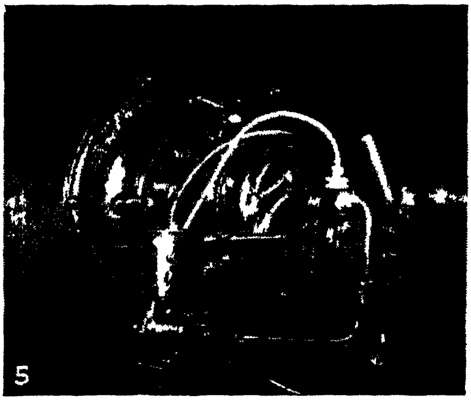
THE varied uses of photography physics and some other sciences essential for advancing the technology of atomisation of liquids form the theme of one of the films—the Shell Petroleum company's Atomisation —shown at the third International Scientific Film Congress which concluded at Brussels this week. Some of the interesting techniques and effects are shown in these excerpts. 1 Liquid from a scent spray type of atomiser being further disintegrated by an air jet from below. 2 The characteristic cone form produced when liquid is ejected from a small orifice with centrifugal force. 3 The high speed camera in readiness to record atomiser performance. 4 Testing results of atomisation of wax by sieving the particles. 5 Industrial spinning cup type atomiser in operation. A fan sets up the powerful centrifugal motion which creates the force to eject a spray. Atomisation will be shown by the London Scientific Film Society on October 19.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AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

CHEMICAL officials of the U.S. Office of International Trade, commenting on the British monetary changes, said that American chemical manufacturers can expect considerably increased competition in foreign markets to result from devalution. Mr. Charles C. Concannon, chief of OIT's chemical division, said that the pound devaluation " calls for more aggressive action to increase exports." American industry, he said, would face considerably increased competition in South America, the U.S. traditional market, as well as in other areas, such as Africa.

* * *

An oil, specially developed for the purpose, will be used to cool the two 90-ton magnet coils of the Carnegie Institute of Technology's 400-million electron volt syncro-cyclotron. The oil permits direct-contact cooling of the cyclotron's copper magnet coils, and hence enables them to be wound much more closely. The resulting magnet is claimed to be the most efficient for this type of service, and, although extremely powerful, is about one-third smaller than others of similar capacity. The " cyclotron oil " will carry off heat from cooling channels as narrow as 1/16th of an inch between the coil windings, and has the characteristic of resisting " break down " or sludging under the destructive catalytic action of copper. It is a good electrical insulator. A circulating system pumps the oil upwards through some 24,000 channels in the magnet coils, and thence to a heat exchanger and to a 42-foot external cooling tower, before being returned to the machine. The magnet temperature will be held at between 30°-45° C.

* * *

A new gas generator, said to open the way to marked advances in analytical chemistry, was demonstrated at last week's meeting of the American Chemical Society by Seymour S. Leikind and Stanley Kirschner, of the Department of Chemistry, Brooklyn College, Brooklyn, New York. The inventors said that the new generator, based on a pressure-equalising, three-way stop-cock and a safety valve, may eventually supplant the Kipp generator, widely used since 1864, in America's chemistry laboratories. Among the gases which can be prepared with it are hydrogen sulphide, carbon dioxide, nitric oxide, and nitrogen dioxide. The inventors claim it avoids the clumsiness of construction, wastefulness of acid, and possible escape of toxic gases by providing virtually sealed-in transmission of gas for many analytical operations. Made of pyrex glass and having a safety valve, it can be heated and is designed to operate at pressures up to 0.8 atmospheres. Higher pressures may be developed with a different safety valve. Objections to the Kipp generator are its inability to change easily from one type of gas to another, danger of spattering acid when gas escapes through the liquid seal and the wasteful use of acid. The new generator removes all of these objections and can provide in a short time a flow of gas resulting from the interaction of a solid and a liquid.

* * *

A U.S. Government patent for accelerating iron ore reduction, assigned by the inventor, John P. Riott, is being offered for licensing on a non-exclusive and royalty-free basis by the U.S. Department of the Interior, Washington. The subject of U.S. Patent No. 2,462,900, Reduction Accelerator for the Sponge Iron Rotary Kiln process, is to provide sponge iron by the thermal reduction of a mixture of oxidic iron ore and a carbonaceous reducing agent in the presence of finely divided sodium aluminate equal to 5 per cent or less of the weight of the iron ore. The method is said also to prevent balling and sticking of the reactants which interfere with the normal operation of usual processes.

* * *

At the close of its annual meeting in Chicago, Illinois, the American Die Casting Institute has announced a certified zinc alloy plan by which die-casters may identify and protect castings with a certification seal. The seal, it was pointed out, will serve as a mark of metallurgical quality. Definite composition limits for zinc die-casting alloys have long been established by the American Society for Testing Materials. The present plan requires frequent sampling of castings by all participating die-casting producers for analysis by an approved laboratory.

Difficult Adjustments in German Industry

High-Cost Imports Limit Chemical Prospects

THE level of chemical production in Western Germany, according to the official index, has now been fluctuating for several months around seven-eighths of the 1936 figure, with no indication of further improvement. Adjustment to the change from a seller's to a buyers' market has been painful for many prominent firms as well as small ones.

Knoll AG, Ludwigshafen, has been working short-time since July. AG fuer Zinkindustrie, Duisburg-Hamborn, reports that sulphuric acid sales are suffering from reduced demands by fertiliser and rayon producers, while sulphurous acid is meeting with marketing difficulties because of dismantling operations in the coal-oil industry which affect the manufacture of synthetic detergents. Graphitwerk Kropfmuehl AG, owner of the only European graphite mine, also complains that home sales are unsatisfactory, while the export business is hampered by the embargo on shipments to other than Marshall countries.

Import Ban

Chemical exports from Western Germany in July produced the equivalent of $6.7 million; the paint industry seems to be the only section of the chemical trades which has been able to expand further its overseas sales during recent months. German chemical manufacturers dependent on foreign raw materials complain bitterly about the import ban imposed by JEIA on a number of imported commodities. Fatty acids, glycerine, talcum, calcium arsenate, rhodium, vanadium, antimony, cadmium, aluminium, copper, tin and zinc are on the list of commodities which must not be imported, pending the liquidation of existing stocks which were acquired at higher prices than are ruling now in the world market. JEIA insists that these stocks should be taken over by German consumers at the original prices, while German industrialists assert that this would make it impossible for them to compete in the world market.

The trade agreement concluded with Holland, unlike earlier trade agreements with other countries, does not fix the proportion of various categories of goods to be supplied but leaves both trade partners considerable latitude in the selection.

Farbenfabriken Bayer, Leverkusen, have signed an agreement with Schenley Laboratories Inc., New York, under which each firm will market the other's products in its own home market and have a two years' option to utilise the other's new processes. Both have agreed to a far-reaching exchange of information, an ambitious joint research programme, the exchange of technicians and scientists, and the formation of a joint committee of scientific and commercial experts to settle the details of exchanges of knowledge.

Mutual Benefit

Bayer, it is stated, will be able to start a once with the design of a penicillin and streptomycin plant based on Schenley's extensive experience in this field, while the U.S. firm will have the benefit of Bayer's research in the field of tuberculosis which has led to the development of the new drug Conteben (TB 1). Schenley is reported to intend to erect a new large laboratory with assistance from Bayer. The agreement. valid for 15 years, has been celebrated in Germany as the first instance of a new approach to international co-operation and resumption of research and marketing contacts with the U.S. chemical industry.

German experts agree with the findings of the Allied committee which investigated opportunities for the most suitable methods of meeting German mineral oil requirements at the lowest possible cost. The Allied experts regarded the lubricating oil and bitumen capacity in existence or under construction as adequate, but recommended the erection of new cracking capacity of 1.5 million tons a year to be affiliated to existing refinery plant and provide a total refining capacity of at least 4.5 million tons a year. Those estimates have been accepted. All German oil companies have in the meantime drawn up plans for new cracking plant and submitted them for licensing. German crude oil production is at present running at an annual rate of 900,000 tons.

Leather Chemicals

Degussa, Frankfurt, has been compelled by financial difficulties to suspend work in the research laboratories at Constance. The manufacture of leather chemicals, ether and pharmaceutical products is to be maintained, despite difficulties created by the dismantling of the hydrogen peroxide installations at Rheinfelden.

The Chemist's Bookshelf

Absorption Spectrophotometry. G. F. Lothian. 1949. London: Hilger & Watts, Ltd. Pp. 196, Figs. 71. 26s.

Although this can be regarded virtually as a new work, by a new author, it is stated to be primarily the third edition of the well-known "The Practice of Absorption Spectrophotometry," of which the first edition was by F. Twyman, and the second by F. Twyman and C. B. Allsopp. The increase in the literature and the improvements in methods have necessitated a very comprehensive revision, so that in many ways the present volume gives a completely fresh approach.

The field covered may be broadly divided into three parts. The first section is concerned with the principles of spectrophotometry. It assumes the reader has little or no prior knowledge of the theory of light involved, taking him by easy stages to the point where he will comprehend the theory behind the more compex applications to such cases as the quantitative analysis of four and five-component mixtures. The second part deals briefly with the many applications of spectrophotometry. Absorption spectra are first related to structure, examples are then given to illustrate the importance of determining the absorption spectrum of a new organic compound at an early stage in its investigation. The use of absorption measurements for the study of photochemical reactions, chemical equilibria and similar problems of theoretical interest is also described. On the purely practical side are instanced analytical applications, both in the field of pure and applied chemistry and in the biological sciences.

The final section is concerned with manipulative aspects of the technique. Apparatus used in photometry, the photographic methods involved where the spectra are recorded, and the instruments and methods for recording by other than photographic means are fully described. As is to be expected, Hilger instruments are dealt with at length, but those by other makers are not neglected. Finally, there is a useful chapter dealing with miscellaneous topics such as light sources, absorption cells and solvents. Throughout the book each range from ultra-violet through visible to infra-red is considered.

A notable omission would appear to be the lack of any detailed consideration of the spectrograph itself. Such consideration would, of course, have required considerable extension. If, however, no prior knowledge of optics is assumed, as is the case in the first section of the book, then it is certain that reference will have to be made by the user to some book dealing more fully with the principles and elementary practice of spectrography than does the present volume.

It is unfortunate that the misplacement of some plates and figure references should have given a sense of disorder to the work.

Atomic Energy Levels

A CRITICALLY evaluated list of all known data on the energy levels of elements of atomic number 1 to 23 has recently been published by the National Bureau of Standards and is now available from the U.S. Government Printing Office. Designed to meet the needs of workers in nuclear and atomic physics, astrophysics, chemistry, and industry, the present volume is the first of a new series which represents the co-operative effort of scientists throughout the world and will constitute the first compilation of atomic energy levels in the last 18 years, during which time the number of known energy levels has increased by a factor of 4 or 5. Spectra are presented in order of increasing atomic number, and listed in order of increasing stages of ionisation. Electron configurations are also given in tables together with term intervals, Lande g-values and term designations in a uniform notation. "Atomic Energy Levels," by Charlotte E. Moore, can be obtained from the superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. ($2.75 plus 33⅓ per cent for postage).

Technical Publications

MANY improvements have been incorporated in the new rolling-door type autoclave for laboratories now being produced by the Barnstead Still & Sterilising Co., Forest Nills, Boston, Mass. The "triple-wall" construction, preventing loss of heat, also ensures quicker warming up, and permits dispersion of heat in the laboratory. There are two removable Monel shelves, and the self-aligning, self-locking door cannot be opened until the pressure is relieved. The autoclaves are in three sizes with choice of gas, electric or steam-heated models.

* * *

A CONSIDERABLE amount of development work has been carried out by manufacturers of fuel-burning plant in collaboration with the coke-producing industry in order to meet the urgent need for automatic coke-burning equipment for central heating. A number of types of coke-fired central heating plant are described (with diagrams), in the September issue of "Fuel Efficiency News," issued by the Ministry of Fuel and Power.

* * *

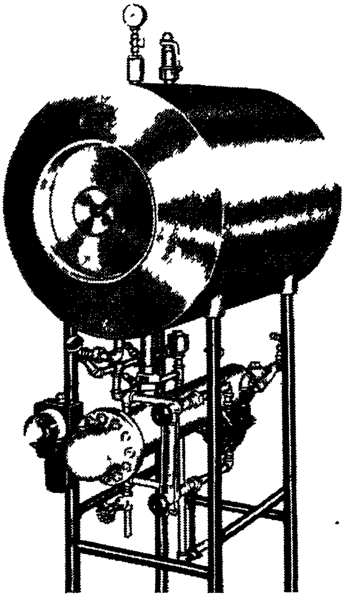
THE trend towards simplicity in design for mechanical handling of goods is exemplified in the new types of the Wrigley light-weight motor truck, the subject of an illustrated folder by Wessex Industries (Poole), Ltd., Dorset. The truck has a variety of body styles suited to different uses, or can be equipped with lifting platforms with simple hydraulic mechanism. The initial cost of operation and maintenance are claimed to be unusually low.

* * *

PLANNING and competition in industry is the subject of discussion by Mr. Robert Shone, economic director of the British Iron and Steel Federation, in its "Monthly Statistical Bulletin" (Vol. 24, No. 8) in which he concludes that planning can best be undertaken by the industry itself. The bulletin, as usual, gives tables of production, exports, imports, numbers at work, etc., for the United Kingdom, and Empire and foreign statistics.

* * *

THE chemical composition of unalloyed irons suitable for different classes of castings is given in "Foseco Foundry Practice" (No. 97), available from Foundry Services, Ltd., Long Acre, Nechells, Birmingham, 7. Technical features included discuss diecoats for pressure diecasting; use of Arbral for cleaning aluminimum bronze, manganese bronze, etc.; Ladelloy heat producing units, and a new model U spray gun.



The Barnstead "triple-wall" autoclave

* * *

"PLANT" is the title of a new publication issued bi-monthly by Chamberlain Industries, Ltd., Leyton. The August issue (Vol. 1, No. 2), contains a wide selection of new and reconditioned industrial plant, including tar boilers, tanks, vibrators, conveyors, and paint spray plant. The same company also announces a number of developments in the range of its bending machines.

Resistant Tank Lining

Atomic energy establishments in the United Kingdom are now using Semtex latex cement as an acid-resisting lining for tanks and piping work for radio-active materials, reports the Dunlop Rubber Co.

• PERSONAL •

Sir Arthur Smout, president of the Institute of Metals, has been elected an honorary member of the Metallurgical and Mining Society of South Africa. Sir Arthur Smout is a director of Imperial Chemical Industries, Ltd.

Appointments to the Agricultural Research Council to fill the posts of members whose terms of office have expired include that of **Prof. G. F. Marrian** (professor of chemistry in relation to medicine, Edinburgh University).

Sir Ben Lockspeiser, secretary of the DSIR, will lead the United Kingdom delegation of 10 taking part in the regional scientific conference held under the auspices of the South African Council for Scientific and Industrial Research at the University of Witwatersrand, October 17-28.

Prof. Po Tha, professor of chemistry in Rangoon University, Burma, is on a five weeks' visit to the United Kingdom under the auspices of the British Council, during which he will see the chemistry departments of British universities and the research laboratories of chemical manufacturers. He was recently appointed by London University as assistant examiner in chemistry for intermediate science examinations (practical).

The "George May" and Institute prizes will be presented by the president (Mr. Haswell Alder), at a general meeting this afternoon (Saturday), of the North of England Institute of Mining and Mechanical Engineers, Neville Hall, Newcastle-upon-Tyne, at 2.30 p.m. Winners of the awards are: **J. D. Brown**, **W. Forrest**, **R. S. Forster**, **D. Fuller**, **J. Graham**, **H. Irwin**, **W. M. Jones**, **T. C. Nicholson**, **R. Purvis**, **D. Turnbull**, **A. H. Walker**, and **J. C. R. Weeks**.

Newly elected Fellows of the Textile Institute are **Dr. F. Howlett**, **Mr. H. A. Turner**, and **Mr. G. S. Watkins**. Dr. Howlett, of Heysham, Lancs., is senior physical chemist at Lansil, Ltd., and part-author of a cellulose textile chemistry section of Reports on Applied Chemistry. Mr. Turner, who has also contributed to the textile chemistry reviews of the reports, is a lecturer at the College of Technology, Manchester, and member of the Board of Faculty of Technology. The elections included 11 new Associates.

Mr. Robert I. Wishnick, president of the Witco Chemical Company, New York, will arrive here on Wednesday for a short visit to England and the Continent.

Mr. E. C. McKinnon, chief engineer of The Chloride Electrical Storage Co., Ltd., for 45 years, relinquished the post on October 1, and has been succeeded by **Mr. C. P. Lockton**, M.Sc., A.M.I.E.E., who has been his assistant and deputy for the last 25 years.

Mr. John M'Gougan, chemical manufacturer, Barrhead, Renfrewshire, left £24,500.

Linoleum Research Council

THE Linoleum and Felt Base Floorcovering industry has set up a research council with the support of the Department of Scientific and Industrial Research. The membership includes substantially the whole industry and the headquarters is in London at Roxburghe House, 273/287 Regent Street, W.1. Dr. S. R. W. Martin, F.R.I.C., A.R.C.S., D.I.C., has been appointed superintendent of research, and a programme of fundamental research has been agreed. The secretary is Mr. A. G. Vaughan.

The initial policy of the research council is to endow research. Arrangements have already been made with the Paint Research Station for work on some of the problems of drying oils, linseed oil, gels, and sealing coats for saturated felts. An information service has been set up, a central library started and a survey of patents relating to the industry begun.

The most obvious scope for research is associated with the oxidation of the basic raw material, linseed oil, and the mixing, compounding and calendering on to hessian backing. There are also paint problems in the printed linoleum and felt base section of the industry.

Obituary

The death is announced of **Mr. Stanley Kiver**, who was for many years an active director of Thomas Hill-Jones, Ltd., manufacturing chemists, and was a keen and successful amateur yachtsman.

◆ HOME ◆

Steel Order from Australia

An order valued at £500,000 for 14,000 tons of steel has been placed in Britain by the Victorian Railways Commissioners.

Summer School in Analytical Chemistry

The London and South-Eastern Counties Section of the Royal Institute of Chemistry is planning to hold a Summer School in Analytical Chemistry in early September, 1950. Full details of the courses, which will be held in Kensington, will be circulated and applications for participation will be invited at the beginning of next year.

Paper Price Reductions

The standard prices for newsprint have been reduced by £4 5s. a ton and the maximum prices of most types of paper and board have also been reduced by new Board of Trade orders which came into operation on October 3. The changes reflect reductions in the prices of pulp supplied by the Paper Control. Prices will remain unchanged in a few cases where pulp prices are not the determining factor.

" Inquest " on Dee Pollution

Nearly every fish in a six-mile stretch of the River Dee in the Newbridge (Denbighshire) area and most of the game fish in another two miles had been destroyed because of pollution, the River Dee and Clwyd Fishery Board were told at Chester on October 1. It was recommended that a meeting should be called of the riparian owners, the Finance and General Purposes Committee and representatives of a chemical company. The company representatives had agreed to a meeting on November 5.

Monsanto Export Activities

A six-day convention for its export agents was held recently in London by Monsanto Chemicals, Ltd. The programme included an address by each agent on conditions in his country; a review of the company's research activities and development schemes; discussions on rubber chemicals and plastics and visits to the works at Ruabon and Newport. At the dinner with which the convention ended, Mr. Edward A. O'Neal, company chairman, emphasised the importance of world trade as a factor for peace, and said that he was convinced the more free trade could be restored, the better were the chances of international understanding.

Soot Statistics

A total of 55 tons of soot fell on a square mile of Bolton during August, it is reported. The town's first smokeless zone is under consideration.

Refinery Expansions

Approval of provision of $17,293,000 to aid the expansion of British oil refinery capacity was announced by ECA in London last week. The dollar aid will be for the Shell Haven refinery, near Stanford-le-Hope, Essex, and the Llandarcy refinery, which have a daily capacity of 8000 and 7500 barrels respectively and are planned to have a capacity of several times as much by 1952.

Scottish Whaling Revival?

The present strong market for oil has encouraged fresh schemes for the revival of the whaling industry in Scotland. Plans are reported for the establishment of a whaling station at Weaver's Bay, on the north-west coast of Sutherland, sponsored by a Norwegian, Captain Hans Jespersen, and a group of Glasgow business men. Scottish Whalers, Ltd., are also said to be investigating the possibilities of the Shetlands and the island of Harris as bases for whaling operations.

Small Increase in Coal Tonnage

Output of deep-mined coal in the first three-quarters of the year was 149,185,700 tons, compared with 145,387,100 tons in the same period of 1948. At this rate of increase the total for the year would be only slightly more than 201.7 million tons. The survey estimated a total of 202 to 207 million tons. In the week ended September 24, total man-power fell by 1600, making a total loss of 4100 in four weeks.

Shell Texile Chemicals

The wide range of uses of the newer detergents is well illustrated on the stand which Shell Chemicals, Ltd., is preparing for the Textile Machinery and Accessories Exhibition at Bell Vue, Manchester, (October 12-22). In the wool industry, the versatility of Shell chemical products is particularly marked, for they can be employed as sheep dips from the time when the wool is growing until the cloth is finished. In scouring of raw wool and backwashing of carded slivers, yarn scouring, carbonising, shrink-resisting and finishing, Shell Chemicals are making new techniques practicable.

Next Week's Events

SATURDAY, OCTOBER 8

Institution of Chemical Engineers

Manchester: College of Technology, 3.0 p.m. (North Western Branch). Dr. S. B. Cormack: “Special Features in the Design, Construction and Operation of Plant for the Manufacture of Toxic Substances.”

TUESDAY, OCTOBER 11

Institution of Chemical Engineers

London: Geological Society, Burlington House, Piccadilly, W.1, 5.30 p.m. R. W. Rutherford and K. Ruschin: “The Preparation of Ammonia Synthesis Gas from Wood Fuel in India.”

Society of Chemical Industry

London: 26 Portland Place, W.1., 6.30 p.m. (Plastics and Polymer Group). S. R. Finn, Dr. N. J. L. Megson and E. J. W. Whittaker (Ministry of Supply): “Recent Progress in the Chemistry of Phenolic Resins.”

London: Royal Institution, Albemarle Street, W.1., 7.0 p.m. (Fine Chemicals Group). Prof. M. Stacey (University of Birmingham): “Biological Polymerisation with Special Reference to Polysaccharide Synthesis.”

Illuminating Engineering Society

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2., 5.15 p.m. Opening meeting of the session. Induction of J. N. Aldington as president.

Incorporated Plant Engineers

Dundee: Mathers Hotel, 7.30 p.m. Film: “The Story of a Steel Wire Rope.”

Manchester: Engineers' Club, Albert Square, 7.15 p.m. (East Lancs. Branch). F. E. Webb (managing director, Aerostyle, Ltd.): “Maintenance of Compressed Air Services.”

Royal Statistical Society

Stockton: William Newton School, Norton, 7.15 p.m. (Tees-side Sub-Group). T. A. Evans: “Operational Research in War and its Extension to Industry.”

WEDNESDAY, OCTOBER 12

Society of Chemical Industry

London: Medical Society of London, 11 Chandos Street, Cavendish Square, W.1 (Microbiological Panel, Food Group), 6.15 p.m. “Aspects of the Mineral Metabolism of Micro-Organisms”: Dr. D. J. D. Nicholas: “Use of *Aspergillus niger* for the Determination of Mineral Nutrients in Soil”: Drs. D. W. Challinor and A. Pollard: “Effect of Ion Exchange Treatment on Composition and Microbiological Stability of Apple-juice.”

Royal Institute of Chemistry

Slough: Community Centre, 6.30 p.m. E. C. Wood: “Quantitative Commonsense and the Chemist.”

Association of British Chemical Manufacturers

London: Grosvenor House, Park Lane, W.1, 7.0 p.m. Annual dinner. Chairman: Sir Harry Jephcott.

British Textile Machinery and Accessories Exhibition

Manchester: Belle Vue. Daily (until October 22).

North Western Fuel Luncheon Club

Manchester: Engineers' Club, Albert Square, 12.0 noon. Opening meeting of fifth annual session. Guest-speaker: Lord Macdonald of Gwaenysgor. 2.15 p.m. Annual general meeting: installation of Dr. A. C. Dunningham as president.

THURSDAY, OCTOBER 13

Royal Institute of Chemistry

Acton: Technical College, High Street, W.3, 7.0 p.m. Prof. C. Tyler: “The Biochemistry of Egg Shell Formation.”

Incorporated Plant Engineers

Newcastle on-Tyne: Turks Head Hotel, 7.15 p.m. H. Knight: “High Frequency Heat Treatment.”

Institution of Works Managers

Wembley: Rest Hotel, Kenton, 12.30 p.m. (Sub-Branch). I. H. Child: “Practical Motion Study.”

Bristol: Royal Hotel, 7.15 p.m. A. P. Young (chairman of the institution): “Teamwork and Productivity.”

FRIDAY, OCTOBER 14

The Chemical Society

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5.0 p.m. (Joint meeting with University College of Exeter Scientific Society). Dr. Kathleen Lonsdale: “Diffraction of Neutrons by Crystals.”

Incorporated Plant Engineers

Nottingham: Welbeck Hotel, 7.0 p.m. (East Midlands Group). “Lubrication,” by a representative of Shell-Mex and B.P., Ltd.

Oil and Colour Chemists' Association

Manchester: Engineers' Club, Albert Square, 2.0 p.m. Dr. R. Hill: “Order and Disorder in High Polymers: Some Technical Applications.”

◆ OVERSEAS ◆

U.S. to Have Another Large Reactor

The U.S. Atomic Energy Commission announces plans to build an atomic pile reactor costing $20 million.

To Develop Barium Chemicals

Extraction and refining of barium sulphate in Argentina have been declared industries "of national interest." To favour their development there will be a strict control on imports. At the moment the barium sulphate used by Argentine tanneries is produced by three firms.

Rising Production of German Aluminium

Production of primary aluminium in the U.S. and U.K. zones of Germany during the second quarter of 1949 totalled 10,127 metric tons, compared with 2896 tons in the first quarter of 1949 and a quarterly average of 1800 tons during the preceding year.

Dollar Earnings for Equipment

The Norwegian Ministry of Trade has announced that manufacturers who export goods for payment in U.S. dollars will be allowed to retain 10 per cent of their earnings to buy manufacturing equipment in dollars. The same concession is to be allowed to exporters earning Swiss francs and Canadian dollars.

Swiss Chemical Exports

Official Swiss trade statistics show that exports of chemicals, pharmaceuticals, dyes and perfumery rose in value during August by 1.7 million Swiss francs to 43.7 million. Shipments of industrial chemicals increased S.Fr. 4.9 million to 6.3 million, those of pharmaceutical products from S.Fr.14.7 million to 17.9 million. There was a contraction in the sale of aniline dyestuffs and indigo (S.Fr.17.1 million).

Chemical Engineering Award

The Celanese Corporation of America has been announced as the winner of the 1949 Chemical Engineering Achievement Award in recognition of the corporation's outstanding programme of post-war developments in the chemical, textile and plastics industries. A committee of more than 50 senior staff of leading colleges and universities in 26 States voted for the award to the Celanese Corporation, the eighth corporation to be so honoured since the award was established in 1933 by the McGraw-Hill Publishing Co. The corporation's developments in petroleum chemistry were also taken into account.

Reported Oil Discovery in Austria

High-grade crude is reported to have been discovered by the Russian controlled Austrian oil company at Matzen, 20 kilometres to the south of the Zistersdorf oilfield.

Indian Manganese Deposits

About a dozen new deposits of manganese ore have been discovered in the Pawnia area in the Balaghat District of the Central Provinces, India, states a report published by the Geological Survey of India.

U.S. Shale Oil Extraction

A recent development in U.S. mining, the actual extraction, in Colorado, of shale oil from the shale rocks and sands of the area, is now reported to have started. The problem of extracting this oil had for a considerable time been engaging the attention of research workers in the U.S. mining industry.

Swedish Iron and Steel

Output of pig iron in Sweden for the period January-June 1949, was 416,500 tons, compared with 383,000 tons for the same period the previous year. Production of cast iron also increased to 676,500 tons (633,900 tons) and rolled and forged iron and steel totalled 463,300 tons, a rise of 44,300 tons.

Sugar Refinery for Uruguay

The Administracion Nacional de Combustibles, Alcohol y Portland (A.N.C.A.P.) has called for tenders by November 30, in connection with the planning and construction of a refinery in Uruguay for the production of granulated sugar. This project represents a new departure in the industrial activities of the State. Specifications, will be supplied by the purchasing offices of A.N.C.A.P. in Montevideo.

New Hydraulic Fluid

The Celanese Corporation of America has announced the development and production of a new, flame resistant tricresyl phosphate base hydraulic fluid. As it is not a chlorinated compound, it does not give off noxious fumes when exposed to very high temperatures; it does not burn, has lubricating properties and corrosion resistance, and so is expected to appeal to diecasters and users of hydraulically operated installations, such as welding machines. It can be adapted for use in any system equipped for non-hazardous hydraulic fluid operation.

FOOD STANDARDS

Ministry Regulations

AN account of four year's administration of the Defence (Sale of Food) Regulations 1943 by the Food Standards and Labelling Division of the Ministry of Food has been published under the title of " The Advertising, Labelling and Composition of Food," (HMSO, price 1s. 6d.).

Under the heading of " Vinegar and Solution of Acetic Acid," the Ministry has indicated that, in order to secure that a solution of acetic acid is not sold under any description which might lead the public to believe that it was malt vinegar, it is preferable that it should be labelled artificial or imitation vinegar. Without prejudice, however, to any legal proceedings which might be taken to test the common use of the description " non-brewed vinegar," the Ministry has not taken exception to this phrase providing that the words " non-brewed " are printed in the same size and style as the word " vinegar."

The Fluorine in Food Order, 1947, is quoted as regards the permissible fluorine content of various articles of food, *e.g.*. eight parts per million of self-raising flour or any similar mixture containing a farinaceous substance and an acidic phosphate.

Relaxing Soap Controls

IMPROVED supplies of inedible oils and fats from the Colonies and other sterling area countries, have permitted increasing the domestic soap ration from the 8-week period beginning November 6. The allowance for ration books R.B.1 (General) and R.B.4 (Junior) will be increased from seven to eight rations, and for R.B.2 (Child) from eight to nine rations per eight weeks. At the same time, soap allowances to most non-domestic users will be increased by one-twelfth.

The Minister of Food has also announced that, as a result of an improvement in the production of synthetic detergents, it has been decided to remove control from soap substitutes as from November 6.

Maximum Metallic Contamination

Permissible maximum limits of content of lead in curry powder and copper in preserved tomato products—both very minute quantities—are specified in the Food Standards (Curry Powder) Order, 1949, and the Food Standards (Tomato Ketchup) Order, 1949, newly issued by the Ministry of Food.

INFORMING WORKERS

Chemical Company's Exhibition

AN exhibition illustrating every feature in the export structure of a large manufacturing organisation was opened recently at the head office of the International Chemical Co., Ltd.

A member of the Works Council suggested that few of the staff fully appreciated the part played by exports in the company's work, and the exhibition was primarily designed for that purpose.

The display consisted of 18 stands showing export sales comparison, some export difficulties and how they are overcome, accounts of research carried out in the firm's laboratories, and general development of ICC and its sister company, John Wyeth and Brother, Ltd.

Countries served by the firm were well-illustrated by the advertising section whose material is translated into 32 languages, and whose executives travel some 70,000 miles every year.

On the conclusion of the exhibition at head office, the display will be transferred to the company's factory at Stamford Hill, and later to the Worcester works.

M.O.R. (Sales) Ltd.

SALES of the products of Manchester Oil Refinery, Ltd., including those which were previously distributed by the subsidiary companies, Petromar, Ltd., Puremor, Ltd., and British Transformer Oil and Lubricants, Ltd., are now to be handled by Manchester Oil Refinery (Sales), Ltd., a recently formed home marketing organisation.

One of the features of the new organisation will be a technical service, working from the refinery, staffed by men with many years' experience in petroleum technology, industrial processes and problems of the lubricating oil trade.

The chemical products division of the new sales company distributes a wide range of products and by-products, including petroleum aromatic extracts, oil-soluble petroleum sulphonates, wetting agents, and sulphonic acids.

Overseas distribution and sales will continue to be handled by Raven Oil Co., Ltd.

Lead Price Falls

The Ministry of Supply announces that from September 30 the price of good soft pig lead is reduced by £3 from £122 to £119 per ton delivered.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary ,but such total may have been reduced.)

British Aluminium Co., Ltd., London, E.C. (M., 8/10/49.) September 2, disposition, granted in virtue of a Trust Deed dated July 30, 1947, and supplemental deed dated November 10, 1948; charged on an area partly land, partly foreshore and partly bed of Loch Leven, site on Kinlochleven Pier and works connected therewith, Lismore & Appin (Argyll), and certain right, title and interest in land. part of foreshore and bed of Loch Leven at Creagan t-Sionnaich, near Ballachulish, as are or will be occupied by Kinlochleven Wharf and pillars and supports of Kinlochleven Pier with erections and buildings, and plant, etc., thereon. *£5,000,000. May 4, 1949.

Electronic Products (Glos.), Ltd., London, S.W. (M., 8/10/49.) September 2, £2500 charge, to Woolwich Equitable Building Society; charged on 28 Colin Road, Barnwood. *£4020. April 30, 1948.

Marchon Products, Ltd., London, N.W., chemical merchants, etc. (M., 8/10/49.) August 30, Trust Deed dated August 19, 1949, securing £300,000 debentures and premiums of up to 7½ per cent in certain events, present issue £300,000; charged on properties, policies, etc., specified in schedule to the debentures and a general charge. *£3525. December 31, 1948.

Russell & Sons (Scientific Instruments), Ltd., London, E.C. (M., 8/10/49.) September 6, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and factory 119 Cromer Street, W.C.1. *Nil. January 1, 1949.

Solartron Laboratory Instruments, Ltd., Kingston - on - Thames. (M., 8/10/49.) September 1, £30 debentures, part of a series already registered.

Turkdean, Ltd., Northleach, manufacturers of chemicals and insecticides. (M., 8/10/49.) September 2, £9930 debenture, to G. L. Pilkington, Liverpool; general charge. *Nil. November 25, 1948.

Satisfactions

Livingstone Refractories, Ltd., London, E.C. (M.S., 8/10/49.) Satisfaction September 7, of charge registered August 3, 1939.

Silica Gel, Ltd., London, W.C. (M.S., 8/10/49.) Satisfactions September 8, of assignments, etc., registered August 20, 1940, March 28, June 7, 1941, May 27, 1942, September 16, 1943, January 22 and July 10, 1945.

Company News

Glaxo Laboratories, Ltd.

Subject to audit, the profits of the company for the year ended June 30 are £1,671,155, of which dividends and income from subsidiary companies amount to £248,066. After provisions, including income tax £634,400, profits tax £210,400 and dividends, there remains a balance of £899,692. A final dividend of 8s. per 10s. unit of ordinary stock, less income tax, is recommended. It is proposed to capitalise £716,715 of the reserves and profits and to issue to the ordinary stockholders nine shares of 10s. each for every 10s. unit of stock now held.

Seaweed Products, Ltd.

The recent announcement of the registration of the above company (The Chemical Age, *61*, 405) should have stated that its objects were " to carry on the business of manufacturers, dealers in seaweed and seaweed products of all kinds, including fertilisers, feed for livestock and fish, medicines, etc."

Increases of Capital

The following increases in capital have been announced :—Industrial Chemicals, Ltd., from £3000 to £10,000. Adolph Hess & Bros., Ltd., from £40,000 to £60,000. Petrochemicals, Ltd., from £3,200,000 to £4,700,000.

Change of Name

Vitax Fertilisers, Ltd., has changed its title to Vitax, Ltd. No change in direction or objectives is involved.

The Stock and Chemical Markets

THE feature in stock markets has been another advance in gold mining shares in response to the first mining returns which reflect substantially higher profits owing to the increase in the price of gold.

British Funds also moved up, both short-dated and long-dated stocks being favoured. The nationalisation stocks participated in this improvement, 3 per cent Transport being 92¼, while 3 per cent Gas (following its recent sharp reaction), had recovered to 91⅛ at the time of writing.

Leading industrial shares were firmer, but buying was said to be much more selective than recently, preference being for shares of companies prominent in the export drive which also have large assets at home.

Chemical and allied shares were generally more active, but best levels were not held. Imperial Chemical, after rising to 44s. 6d. came back to 44s., Monsanto were firm at 51s. 10½d., Brotherton 10s. shares 20s., Albright & Wilson 5s. ordinary 30s. 3d., and Amber Chemical 2s. shares 5s. 3d. F. W. Berk 2s. 6d. shares were 12s. 6d.. Boake Roberts 28s. 9d., and Bowman Chemical 4s. shares 6s. 9d.

Among preference shares, L. B. Holliday 4½ per cents were 20s. 6d., British Chemicals & Biologicals 4 per cents 19s., and W. J. Bush 5 per cents 23s. In other directions, Fisons ordinary were 28s., and Laporte Chemicals 9s. 3d.

News of the share bonus of nine 10s. shares put Glaxo Laboratories 10s. shares up to £19¾; sentiment was also helped by the company's profit figures for the past financial year and the unchanged dividend rate of 125 per cent. Assuming dividend limitation is in force next year, the company will presumably only be able to distribute in cash the same amount to shareholders as for the past year,' which would mean not more that 14 per cent on the capital which will be increased nine times by the share bonus now proposed.

Turner & Newall have been firm at 78s. 1½d., United Molasses at 41s. 9d. were also favoured because of the company's American interests, while Dunlop Rubber were 64s. 3d., and Borax Consolidated 57s. 6d. Lever & Unilever changed hands around 42s. 6d.; British Match improved to 33s. 6d., but British Glues & Chemicals 4s. shares eased from 19s. 6d. to 19s.

The prospect that the London Metal Exchange may be re-opened next year, kept Amalgamated Metal shares active around 19s. British Aluminium, after their recent small decline, have been steadier at 42s. 6d. Iron and steels remained uncertain, although, awaiting results, United Steel rallied to 26s. 3d.

Boots Drug firmed up to 51s. British Xylonite have been steadier at 75s., Industrial Plastics 2s. shares were 4s. 10½d., and De La Rue 23s.

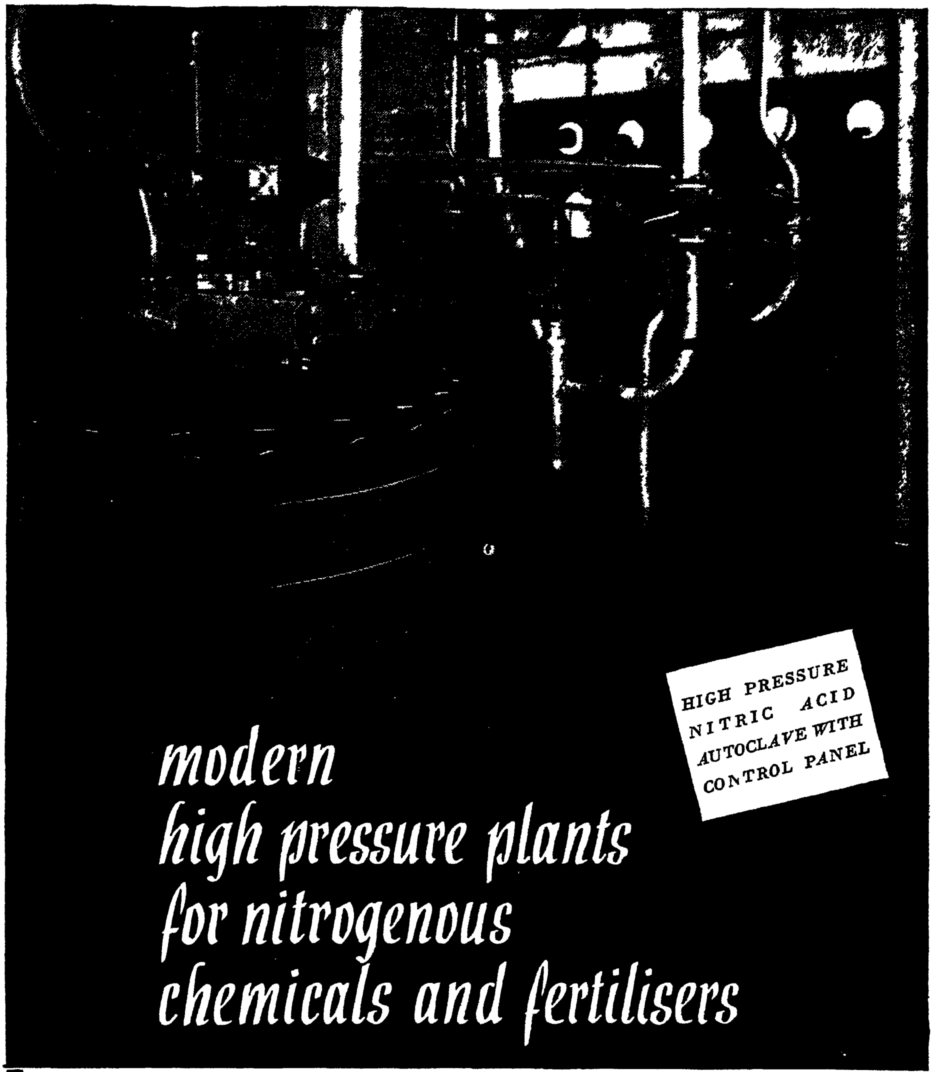
Oil shares vere easier, Anglo-Iranian at 7¼, Shell 69s. 4½d., and Trinidad Leaseholds 27s. 3d.

Market Reports

CONDITIONS in the chemicals market during the past week has been somewhat hesitant, with new business limited to buyers' nearby requirements. This is particularly so where quotations have advanced as a result of devaluation. Higher prices for borax and boric acid have been announced to come into operation on October 22. The recent advance in the prices of the non-ferrous metal compounds has been followed by a further adjustment in the convention quotations for red and white lead in consequence of the decline in the metal. The new basis price for white lead is £143 10s. per ton (45s. lower); ground in oil £160 15s. Dry red lead has been reduced to £135 10s. per ton; (ground in oil) to £156 per ton. The effect of the lifting of the import licensing restrictions is almost certain to lead to more competitive conditions in a number of items but no immediate influence on price rates is expected. The volume of export inquiry remains good and in the coal tar products market a better U.S.A. inquiry is reported for ADF cresylic acid.

MANCHESTER.—Home trade business in heavy chemical products on the Manchester market during the past week has been on a fair scale so far as new bookings are concerned and actual deliveries of textile and other industrial chemicals against existing contracts are going forward satisfactorily. Shippers' inquiries in respect of export transactions have been fairly numerous. In the fertiliser section, quiet conditions are reported in some lines, but in slag and the compound fertilisers, in particular, a steady trade is being done.

GLASGOW.—The volume of turnover of chemicals in the Scottish market has not been heavier than usual, despite the fact that buyers realise that prices of a number of materials are likely to increase during the next few weeks.



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SLOane 9282 Cables Bamag, London

19/1

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of vinyl compounds.—W. E. Jones and R. L. Barker. Oct. 11 1947. 628,731.

Manufacture of sulphonyl fluorides.—Pest Control, Ltd., D. W. Pound and B. C. Saunders. Oct. 17 1947. 628,796.

Process for the manufacture of pyridyl-3-carbinol.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co. Akt.-Ges.). May 2 1947. 628,733.

Cast polymerisation of unsaturated alcohol esters of polybasic acids.—Pittsburgh Plate Glass Co. June 4 1942. 628,944.

Formation of deposits by the evaporation of a substance on to a supporting surface.—H. Cassman. July 31 1945. 628,954.

Apparatus for accelerating charged particles, especially electrons, to very high velocity.—General Electric Co., Ltd., and W. E. Willshaw. Nov. 14 1945. 628,806.

Production of fluoro-carbons.—Imperial Chemical Industries, Ltd., W. N. Howell and N. F. Sarsfield. Nov. 26 1945. 628,807.

Fluid-pressure valve.—Dunlop Rubber Co., Ltd., and H. Trevaskis. Feb. 19 1946. 628,959.

Plasticised elastomer compositions. — American Cyanide Co. April 4 1945. 628,875.

Devices for the separation of air or gas from a flowing liquid.—J. Loder. April 12 1946. (Convention date not granted.) 628,813.

Curing polymerisable materials. — Libbey-Owens-Ford Glass Co., A. M. Howald and J. K. Simons. May 25 1946. 629,093.

Art of reclaiming plastic scrap.—Gem Participations, Inc. June 27 1945. 628,876.

Production of synthetic resinous material.—American Cyanamid Co. July 13 1945. 629,095.

Lubricating compositions comprising carbon black and organo-silicon oxide polymers.—Dow Chemical Co. July 18 1945. 628,878.

Production of water-soluble methylol melamine condensation products.—American Cyanide Co. Aug. 25 1945. 628,818.

Fluid sealing devices.—Crane Packing, Ltd., and F. C. W. Wilkinson. Aug. 13 1946. 628,974.

Resinous material.—American Cyanamid Co. Sept. 15 1945. 628,821.

Method and apparatus for extracting pigments from fatty materials.—General Biochemicals, Inc. Oct. 13 1943. 628,879.

Detection and measurement of organic vapours. — E. O. Powell and G. R. Smithson. Sept. 3 1946. 628,824.

Processes of tanning and the tanned materials, for example, leather, resulting therefrom.—J. R. Evans & Co. May 11 1946. 628,989.

Electrical measuring and control devices.—Liquidometer Corporation. July 8 1946. 628,834.

Method of sizing or finishing textile materials, yarns, and fabrics, and the finishing composition therefor.—Monsanto Chemical Co. Dec. 1 1945. 629,097.

Methods of sizing or finishing textile materials or yarns, and the finishing composition for use in said method.—Monsanto Chemical Co. Dec. 1 1945. 628,881.

Stabilisers for photographic emulsions. —General Aniline & Film Corporation. Dec. 15 1945. 628,994.

Manufacture of emulsions serving as binding agents for the fixation of pigments on fibrous materials.—Ciba, Ltd. Nov. 28 1945. 628,882.

Device for producing metal compounds by electrolysis.—Sirco Akt.-Ges. Dec. 11 1945. 629,099.

Preparation of dyestuff intermediates and of dyestuffs therefrom. — Gevaert Photo - Producten N.V., A. E. Van Dormael and T. H. Ghys. Dec. 13 1946. 628,837.

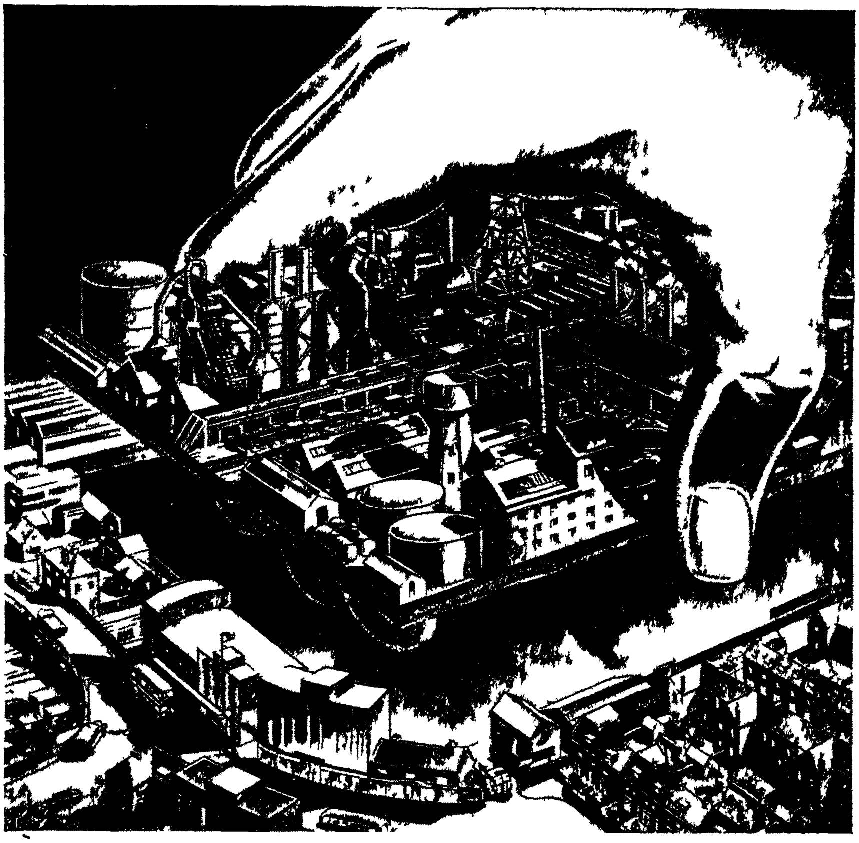
Process and apparatus for the continuous after-treatment of flocculous textiles with exclusion of air.—Algemeene Kunstzijde Unie N.V. March 27 1946. 629,100.

Compositions containing halogenated fluoresceins.—S. Gottfried. Dec. 24 1946. 629,102.

Pyrogenation of bituminous schist bituminous limestone and lignite. — Centre d'Etudes et de Recherches Techniques du Petrole, des Carburants et des Lubrifiants. Jan. 24 1946. 629,002.

Method of electrolytically producing zinc of high purity.—Hudson Bay Mining & Smelting Co., Ltd., S. P. Lowe, G. W. Long, G. H. Kent and K. W. Downes. Jan. 28 1947. 628,842.

Process for the manufacture of cellulose esters.—Soc. Rhodiaceta. Feb. 8 1946. 628,844.



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Polymerisable materials and polymers thereof.—Imperial Chemical Industries, Ltd., R. G. Roberts and R. Hammond. Feb. 14 1947. 629,015.

Polymerisable materials and polymers thereof.—Imperial Chemical Industries, Ltd., and R. Hammond. March 10 1947. 629,019.

Control of contrast in photographic diazotype materials.—General Aniline & Film Corporation. May 13 1946. 629,024.

Process for the manufacture of biotin.—Roche Products, Ltd. May 31, 1946. 628,902.

Stabilising synthetic polymers — Dow Chemical Co. Sept. 19 1940. 629,035.

Photoprinting diazotype layers and process of making transition prints.—General Aniline & Film Corporation. Dec. 12 1945. 628,914.

Cashew nut shell liquid furfuraldehyde condensation products.—Harvel Corporation. July 17 1940. 628,921.

Methods of stabilising methyl-substituted polysiloxanes.—British Thomson-Houston Co., Ltd. Sept. 28, 1946. 629,046.

Brazing aluminium or aluminium alloys. —British Oxygen Co., Ltd., and L. C. Percival. Oct. 21 1947. 629,048.

Manufacture of soft glass having wide working range.—Corning Glass Works. Nov. 20, 1946. 629,049.

Fabricated articles, parts of which are vitreous material and parts of carbonaceous material.—British Thomson-Houston Co., Ltd. Oct. 24 1946. 629,054.

High temperature severing of chromium alloy steels.—British Oxygen Co., Ltd., and C. Coulson-Smith. Oct. 28 1947. 629,075.

Uranium Production and Location

NEW sources of uranium were reported from both the U.S.A. and Australia last week and production of the mineral in Canada during 1948 was over £1 million in value, according to the annual report of the crown-owned Eldorado Mining Co. Plans are also under consideration by the company for new drilling activities in Northern Saskatchewan.

The discovery of radioactive minerals at Rumjungle, about 50 miles south of Darwin, was announced by Mr. Victor Johnson, Australian Minister for the Interior, who said that samples had been sent to the Bureau of Mineral Resources in Melbourne for examination.

Uranium-bearing pitchblende has been found on the property of the Sunshine Mining Co., near Kellog, Idaho, U.S.A., but it is not at present considered to be of economic importance.

THE METAL SULPHATES

Simple Industrial Adaptations

PRODUCTS with a number of valuable uses may be obtained by causing reactions to take place between various polyhydric alcohols and trivalent metal sulphates. According to claims made by M. Landau, in U.S. Patent No. 2,466, 445, the resulting stable, viscous, resin-like materials may be used as textile softeners and sizes, as fire retardants, clarifiers and tanning agents.

An illustrative process, employing glycerine, indicates that aluminium sulphate hydrate ($Al_2(SO_4)_3 18H_2O$) is heated slowly with an equal weight of glycerine with constant stirring until the boiling point is reached. Boiling is maintained until the mixture is reduced to 88 per cent of the combined weights of the original materials. This yields a viscous, water-white, heavy liquid.

Similar products may be obtained from mixtures of glycerine with ammonium sulphate, crystalline chromic sulphate, potassium chromic sulphate, ferric sulphate or ferric ammonium sulphate. The mixtures are heated until weight losses of 10 to 40 per cent occur. The resulting products are generally soluble in hot water, but not in oils and certain organic solvents.

Electron Food Steriliser

WORKERS in the U.S. Electronised Chemicals Corporation have designed a powerful "electron gun" for the sterilisation of food, states a recent report to the American Chemical Society. The electron stream incapacitates the reproductive mechanism of bacteria and viruses. Known as the Capacitron, the apparatus generates 3 million volts for periods of a thousandth of a second. Duration of the radiation is claimed to be so short that there is no appreciable rise in temperature of food treated, and taste, odour and appearance are not changed.

The Capacitron achieves its results by drastic action against desoxyribonucleic acid, a chemical believed to be a key constituent of genes. Viruses consist almost entirely of chemicals closely related to desoxyribonucleic acid.

Desoxyribonucleic acid appears to be a polymer consisting of chemical chains each composed of many individual molecules. The electron stream breaks the links, destroying the biological activity of the acid, while the chemical composition remains unchanged.

The
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World News of Chemistry

AMONG the factors making for frustration and uncertainty, to which most of us have been subject since 1939, the security-minded official (who maintains that to disclose almost anything would be " not in the public interest ") has been familiar and exasperating. Complementing the positive withholding of information are the sins of omission, much less heinous and more or less inadvertent perhaps, but no less potent in causing confusion. To the latter and more innocent category belongs the failure of the International Union of Chemistry to ensure that wide publicity was given to the decisions recently reached by leading chemists of nearly all countries to recognise certain names for elements more or less newly revealed. (THE CHEMICAL AGE, *61*, 481). Because of the authority which its impartial devotion to the long-range interests of science has conferred on the International Union, any of its decisions with an enduring effect are matters of more than academic interest to the rest of the world. That makes it no easier to understand why the first record of its agreement on nomenclature of such vital substances as wolfram, columbium, promethium, protectinium and the rest was left to be presented in the form of an independent report made to the American Chemical Society.

This, unorthodox as it now appears, is not a unique occurrence nor is the discontent to which it is bound to give rise an expression of pique that the U.S.A. should have had the gratification of being first to be notified. Both those statements are borne out by the somewhat discouraging circumstance that this has happened before, and on that occasion Britain was the privileged first recipient of the news. That was the announcement of the International Union's recommendations on international acceptance of symbols, units and nomenclature and the reporter was Sir Charles Darwin in an article on *Nature* (THE CHEMICAL AGE *61*, 305). It scarcely needs saying that neither Sir Charles Darwin, or the American chemists now, are open to criticism for having done in their own countries what the International Union should have done for all.

The International Union of Chemistry is the permanent international organisation of the profession of chemistry, a federation of member nations. To it are affiliated national organisations of various detailed types. British representatives are the National Committee for Chemistry of the Royal Society. In the U.S., the representa-

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

tive organisation is the Division of Chemistry and Chemical Technology of the National Research Council. The objects of the union are to assure permanent co-operation between the chemists of the participating countries "to co-ordinate their scientific and technical activities and to contribute to the advance of chemistry in the whole wide sweep of its vast domain," as one commentator put it—without overstating the union's case. These objects are achieved notably through conferences and congresses and by the work of international commissions composed of distinguished experts.

Many federated interests for the promotion of common ideas or practical requirements still rise above the limits imposed by national frontiers and their influence for international collaboration is too precious just now to be endangered. They include government groups, trade unions and specialised and professional bodies.

A comparable body which it is profitable to consider is the International Organisation for Standardisation. This comprises Standards Institutions all over the world. After a recent conference of this body, duplicated sheets listing decisions taken were issued by each national centre to their own general and technical Press.

If we seek to carry this parallel again into the field of chemistry we find that the Royal Society's National Commitee for Chemistry issues neither statements nor minutes of proceedings. How then are members of the chemical profession to be kept informed of international agreements? There is, of course, a very simple way of disseminating information—although it is not one likely to commend itself warmly to those who help to direct policy on an international basis. It is the method by which the technical Press did, in fact, actually get news of the International Union's recommendations, *via* special correspondents and the ordinary international news agencies.

In a witty and pertinent comment on publication of research, D. G. Williams at the Royal Society's Empire Scientific Information Conference put forward the following formula.

> Value of a research = worth-whileness of objective × efficiency of presentation × effectiveness of reporting.

If any of these factors is zero, the value of the product is zero. Does not some similar criterion apply to the fundamental conclusions of the IUC?

Notes and Comments

Plain Talk

LOOKING for some good to emerge from the devaluation strategem would so far have been very unrewarding, were it not for the much greater readiness to recognise harsh facts, too often evaded, which has recently characterised much of the public comment. More encouraging than anything else is the widening acceptance of the truth that nothing short of unstinted hard work and a high rate of production will release this country from the "poor relation" status and avert the immediate prospect of a situation even less attractive. The leadership among the plain spoken fraternity probably belongs to Mr. A. Lord, chairman of the Austin Motor Company, for his revealing comments on the subversive work still carried on by an irresponsible proportion of trade union officials, for whom a Socialist Government's reiterated appeals for production above all else appear to carry less weight than with any other section of the community. If all shop stewards were of the same sort the prospect of recovering prosperity by increasing production would be vain indeed. Most fortunately, they are not—as the good relations and excellent export trading results of several big chemical groups go to prove.

Coal Costs

CHEMICAL industry has, however, every reason to applaud this tendency to tell the truth without too much regard for political taboos, because it has permitted one of the chiefs of the nationalised coal industry, Sir Hubert Holdsworth, K.C., to say publicly what virtually all the heavy industries have long known—that the price of coal and what comes from coal is to-day too high to support a healthy industrial life. It has been left to the chairman of the East Midland Division, NCB, to admit that if a reduction of about 5s. per ton in the course of the next 15 years (THE CHEMICAL AGE, *60*, 439) is the best we can hope for, there is little chance that we shall survive as a first-class industrial power. Every industry using coal on the scale required by basic chemicals production, even excluding the carbonisation industries, knows that the inflation of coal prices ranks with labour costs among principal reasons for the inability to offer keenly competitive prices in world markets. Devaluation, it is well to remember, will not dispose of that need in most of those markets. The chairman of the East Midland organisation puts the minimum coal economy at a reduction of average prices by £1 per ton (leaving the charge still 65 per cent higher than it was pre-war). His contribution to the familiar debate is heartening because of the new note of realism it strikes and some evidence that this is more than mere theorising. He disclosed that in his division something is being done to bring nearer the desirable prospect. A new coal face machine and three-shift working in one pit aimed to raise output about 150 per cent per manshift; in another, output might be doubled by new technique. If he forces adoption of his own precept—"No restrictive practices in industry and no restriction of the use of original brains"—he will come to be regarded as the patron saint of all the heavy industries.

Soft Words

OUTSPOKENESS about colliery performance is, however, just as rare as ever. Whatever the foregoing portends it does not mean there has been a sweeping conversion to realism of the higher administration of coalfields. The chairman of the NCB, if he sees any need for drastic change, keeps his convictions to himself. That can be concluded from Lord Hyndley's remarks to Yorkshire mineworkers at a trades union school for an education group at Bingley. He told them (records *Coal*) that they had done very well, but he felt they could do a little better. "Still a bit more" should be their aim. "I see no reason, if we go all out, why we should not reach something like 207 million tons in the year," he said. "We are surely not going to be satisfied with 202 or 203 millions." . . . Is it irrelevant to recall that in 1913 the mines provided 287 million tons?

OCCA Lectures

THE OCCA post-graduate lectures have now, without doubt, established themselves as an institution. Attendance this year does not reach the crowded peaks of some of the earlier years' lectures, but seems to have steadied at a high level. Once again, a distinguished scientist refreshes mainly practical industrial investigators with reminders of basic principles once well known and gives guidance on some yet to be encountered. The subject of this year's series is "The Design of Experiment" and the lecturer is Prof. M. G. Evans, F.R.S. The theme is illustrated by references to the lecturer's specialised field of study, the mechanism of chemical reactions. Prof. Evans has aimed to show how ideas develop in a field of investigation and how experimental techniques are evolved to follow those ideas. In the opening lecture just two theoretical ideas and two experimental approaches in the field of gas kinetics were discussed. Liberally illustrating his remarks with slides, three-dimensional models, charts and actual pieces of apparatus, the speaker traced the history of work with very rapid reactions and less rapid reactions. For the former, stationary state techniques have proved useful, for the latter, flow methods. The inter-play of planned programme and chance observation, the mutual interaction and modification of theory and techniques during the course of a research were convincingly represented. There is a tendency, however, perhaps inevitable, for such treatments to consist more of examples than of conclusions, to offer more history of the studies than discussion of the design of experiment. More explicit treatment of the latter may come later. Meanwhile, the students at these lectures have an extraordinarily valuable refresher course in a subject—pure chemistry—which tends to be neglected during industrial practice.

Taking no Chances

FRANCE, having adopted the principle of State payment for essential mendicaments, has done so with some interesting reservation. Suppliers of pharmaceuticals will be reimbursed—if they do not indulge in "great publicity campaigns"; if their retail prices are not more than 120 per cent of the production cost; and if their products "are not agreeable to the palate" (no free sweets). Some 10,000 medical preparations have so far been subjected to the critical survey of a technical commission and about 75 per cent of them have passed the ordeal. Of others, price reductions or changed formulation have been ordered.

Chemistry of Oils and Fats

"THE Modern Chemistry of Oils and Fats" is the subject of a series of 12 post-graduate lectures at present being given on Friday evenings at 7.30 p.m. at the Acton Technical College, London, W.3.

The first of three groups consists of five lectures covering the analysis of fats and fat-containing materials. Two lectures are by K. A. Williams on "Analytical Methods Used in Modern Fat Chemistry," and "Analysis of Fatty Foods." J. H. Hamence deals with "Analysis of Feeding Stuffs," and C. Whalley gives two lectures on "Micro Analysis as Applied to Fats."

"Synthetic Fatty Acids and Synthetic Fats," are covered by P. N. Williams in two lectures, and "The Dry of Oils" by L. A. O'Neill in a further two lectures, comprise the second group.

The final group is a series of three lectures by F. L. Warren dealing with "Some Aspects of the Biochemistry of Fats."

The series, which began on September 23, will continue throughout the autumn term.

ITALY'S OIL AND CHEMICALS

U.K. Interest in Refinery Plans

WORK on the site of the new large Condor refinery at Rho, near Milan, Italy, is reported to be progressing satisfactorily. At the same time, planning and development work has started on the 100-mile 10-in. pipeline which will carry crude oil from Genoa to the refinery.

Condor is completely independent of the major oil companies or of any crude oil producer. It will, therefore, be able to fulfill the important function for the Italian economy of purchasing crude oil from the most advantageous source, having regard to quality, price and availability of foreign currency.

The setting up of a distributing organisation is by no means ruled out, but it is thought that Condor will find a more rational way of distributing its products through existing agencies—some of which have, up to now, based their business on the handling of imported products but will have to take their future supplies from Italian refineries. Friendly relations exist with Aquila (the only other independent Italian oil refinery), but the two companies are quite independent.

There is also a friendly relationship between Condor and the Manchester Oil Refinery group in England. The latter has interests in Condor, and the arrangement will enable Condor to keep in close contact with modern developments in refining technique and with markets.

It is possible that Condor will co operate closely with Petrocarbon, Ltd., the M.O.R. associate, in the erection of the new Italian refinery, pipeline and tank installation, and will also be very active in future in the field of chemicals from petroleum, for which there is a great need in Itay.

Widening Scope of Francolor

TEXTILES chemists from several European countries, in the course of their 22nd Congress visited the Francolor factory at Saint-Clair. M. Jean Claudin, director general of the factory, stated in his address, that the Francolor company comprises four factories employing 7000 persons and producing 200 tons of dyestuffs monthly. The company claims now to be able to satisfy 89 per cent of the needs of its French customers, and large exports are being made to South America, Europe, and even China.

DOLLARS OR CHEMICALS ?

U.S. Official Urges Barter System

BARTERING chemicals in international trade as an immediate and productive means of maintaining volume is being advocated by Mr. Frederick W. Richmond, president of the United States Foreign Corporation, New York, who says it is particularly pertinent at this time when many orders are being cancelled because of present unsettled currency valuations. Mr. Richmond has disclosed that his company has recently successfully concluded barter transactions on a chemical-for-chemical basis when Italian producers cancelled orders because of their uncertainty over the relationship of the Italian lira to other devalued European currencies.

Chemical-for-chemical barter, he maintains, has many advantages over barter transactions involving products or commodities of two different classifications. Licences, import and export, are more readily obtainable when items of the same classifications and group are involved; and barter transactions in chemicals can be conducted with a minimum expenditure of time and effort.

"While almost any known chemical can be produced in the United States," he said, " some of them are not produced here in sufficient quantity to meet democratic demands, and we, therefore, have constant need for large quantities of such chemicals, drugs, essential oils and gums as castor oil, anise, arabic, copal, magnesium carbonate, magnesium chloride, cresylic acid, sodium perchlorate and others.

" On the other hand, the United States manufactures, principally in competition with Great Britain and Germany, a great number of chemicals required for every medical and industrial use in every country of the world.

" Thus a foreign importer is usually willing to barter on a chemical-for-chemical basis," Mr. Richmond continued, " in the assurance that he can readily transfer any chemical shipment into scarce dollars."

Austro-Indian Trade

A recent trade agreement between Austria and India provides for the shipment by Austria of Chemicals, including lithopone, ultramarine dyes, insecticides, etc., valued at £31,250, 15,000 metric tons of steel and of instruments and apparatus worth £37,500. India will ship, *inter alia*, rubber, resins and manganese ore.

Leather Chemists Confer in Paris

Report on Practical Uses of Electrochemical Technique

INVESTIGATION of basic chromium chloride and chromium sulphate solutions by means of an ion exchange and spectrophotometric methods was the subject of a paper (summarised below), by K. H. Gustavson, who represented the Nordic countries (Sweden, Norway, Denmark and Finland), at the first congress of the International Union of Leather Trades' Chemists at the Maison de la Chimie, Paris.

Cationic Complexes

Dilute solutions of pure 33 per cent basic chromium chloride (0.4 eq. ./1) contain only cationic Cr complexes and in concentrated solution (8 eq. ./1) practically all Cr is in this form. The cationic complexes contain no complex-bound Cl-groups, being present in the form of hydroxo- or oxo-chromic complexes.

The absorption spectra of these solutions, measured at a concentration of 0.02 eq. ./1, are practically identical, agreeing with the results of the ion-exchange The same basic chromic chlorides containing NaCl corresponding to $Cr_2(OH)_2Cl_4 . 2NaCl$ contain positively charged complexes to the extent of 100 per cent in the dilute solution.

In the concentrated solution, a small percentage of the total chromium is present as molecules (uncharged complexes), the remainder being cationic complexes. A part of these exist as chloro-oxi-Cr-cations.

The absorption spectra of the concentrated solution measured at 0.02 eq. ./1 Cr, show marked differences, the extinction of the concentrated solution being very much greater than that of the dilute solution. Further, the maximum absorption of the concentrated solution is displaced towards the longer wave lengths.

Distinguishing Characteristics

Dilute solutions of pure 33 per cent chromic sulphate, without Na_2SO_4, contain only positively charged Cr complexes, with one sulphate group held by two Cr atoms in the complex. About 90 per cent of the total Cr of the concentrated solution (8 eq. Cr./1) is present in the form of cations, the rest being uncharged. The absorption spectra of the two solutions are practically equal. By adding 1 molecule Na_2SO_4 per molecule Cr_2O_3, the ion-exchange data show that in dilute solution, practically all the Cr carries positive charge.

On the other hand, the concentrated solution contains uncharged complexes (molecules of basic chromium sulphate), as its main constituent. A few per cent of the total Cr is in the form of negatively charged complexes, the rest carrying a positive charge.

The extinction of the concentrated solution is very much greater than that of the dilute solution measured at 0.04 eq. Cr ./1. The spectrophotometric indications of structural alterations of the chrome complex confirm the results of the ion-exchange reactions.

Process Results

By tanning pelt for 3-4 hours with 33 per cent basic suphate $Cr_2(OH)_2(SO_4)_2$ Na_2SO_4 in (a) aged solutions and (b) in solutions diluted to the final concentration immediately before use (*i.e.*, 0.4 eq. Cr ./1), the Cr fixation from the freshly prepared solution is 50-80 per cent greater than that fixed from the aged solution with equilibrium attained. The shrinkage temperature of the pelt tanned in the former solution is a few degrees lower than that obtained with the aged solution.

It is noted that the Cr fixation and the shrinkage temperature of pelt tanned in Na_2SO_4-free basic chromium sulphate are the same from the aged and freshly prepared solutions. The same trend is shown by the basic chromium chlorides.

The different behaviour of the basic chromium sulphate of the regular chrome liquor type is considered to be due to the uptake of uncharged chromium.

The congress was opened by Monsieur A. Boidin, president of the French Association of Leather Trades' Chemists, and the chairman of the union's executive committee, Prof. Paul Chambard, French leather scientist and director of the French Tannery School, Lyons. Other members of this committee were Mr. J. R. Blockey, vice-president, and Mr. A. Harvey, general secretary, and Dr. D. Burton, treasurer of the union.

The following countries were represented by one or more delegates who reported on the work of their respective societies: U.K., the U.S.A., France, Italy, Sweden, Norway, Denmark, Finland, Switzerland, Holland and Belgium.

The new membership of the American Society of Leather Trades' Chemists was warmly greeted by the British president, Mr. N. L. Holmes, who said that it greatly strengthened the position of the union.

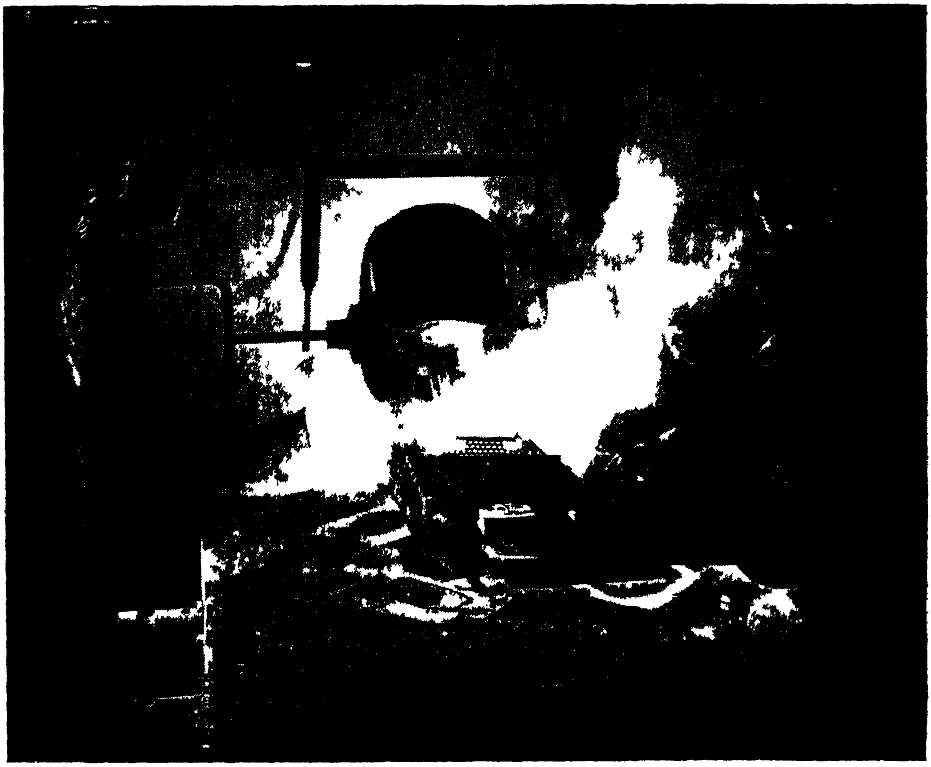
The offer of the British delegation to hold the next international congress (1951) in London was unanimously accepted.

Composition of the executive committee of the union from January 1. 1950, was announced by Prof. Chambard, and consisted of the following:—

Mr. J. R. Blockey (Great Britain) first president; M. V. M. J. Mallebay (France), first vice president, and Prof. P. Chambard (France) second vice-president (co-opted Dr. H. G. Turley, U.S.A., and Mr. K. H. Gustavson, Nordic countries); hon. treasurer, Dr. D. Burton (Great Britain); hon. secretary, Mr. A. Harvey (Great Britain).

Other interesting papers delivered at the congress included: "Comparative Study of Chromium and Aluminium Complexes in Solutions," by F. Grall; "The Effect of Tanning Conditions on the Period of Tannage and the Distribution of Chromium in Leather," by F. Stanley Briggs; "The Effect of Acids and Salts on the Tanning Properties of Catechol Tannins," by G. W. Humphries and J. W. Atkinson; and "The Importance of pH Value, and of the Concentrations of Salts and Acids in Vegetable Tanning," by Dr. M. P. Balfe.

Industry Inspires Fine Photographic Studies



The service of photography to industry and the part it can play in the expansion of trade are emphasised by an exhibition organised by the Institute of British Photographers, which closes in London to-day. Representative of the high standards achieved was this photograph by Neil Nimmo, showing the pouring of magnesium in sand in the foundry of High Duty Alloys, Ltd., Slough

Basic Chemicals in July

Improvement in Stock Position Continued

STOCKS of basic chemicals in July again showed a slight increase over the previous month and over July 1948. Production figures generally reflected a small increase, with the exception of compound fertilisers; the level of consumption showed little change.

Estimated numbers employed in all sections of the chemical and allied trades were slightly higher in July than in the previous month, and also showed an increase over the totals for June 1948. Distribution of workers (in thousands) was as follows: coke ovens, chemicals and dyes, explosives, etc., 250.2 (183.2 men, 67.0 women); paints and varnishes 38.0 (26.7 men, 11.3 women); oils, greases, glue, etc., 64.6 (51.4 men, 13.2 women); pharmaceutical, toilet preparations, etc., 82.3 (41.2 men, 41.1 women).

These figures and the tables given below are abstracted from the latest issue of the *Monthly Digest of Statistics*, No. 45.

	July, 1949 Thousand Tons			July, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	131.1*	126.0	—	122.7*	123.0	—
Sulphur	—	25.5*	105.8*	—	20.8*	80.3*
Pyrites	—	16.1*	72.0*	—	15.7*	62.0*
Spent Oxide	—	15.7*	173.3*	—	16.2*	158.2*
Molasses (cane and beet)	9.8	33.2†	260.2	13.2	34.4†	189.7
Industrial alcohol (mil. bulk gal.) ...	2.82	2.5	4.94	2.39	2.2	8.11
Superphosphate	17.6‡	17.6‡	—	18.3‡	15.2‡	—
Compound fertilisers	113.9	127.9	—	122.3	105.0	—
Liming materials...	—	377.1	—	—	341.2	—
Ammonia	—	6.45*	6.15	—	6.45*	11.37
Nitrogen content of nitrogenous fertilisers	21.64	15.96	—	21.26	18.54	—
Phosphate rock	—	73.3	219.5	—	70.2	186.6
Virgin aluminium	2.52	11.2	—	2.38	12.2	—
Virgin copper	—	25.2	142.1	—	26.9	99.9
Virgin zinc	—	12.5	81.7	—	16.1	52.4
Refined lead	—	13.2	54.7	—	16.2	22.3
Tin	—	1.44	21.8	—	2.16	15.7
Zinc concentrates	—	11.4	44.0	—	14.7	47.0
Magnesium	0.42	0.38	—	0.24	0.29	—
Pig iron	182.0*	—	494.0*	174.0*	—	282.0*
Steel ingots and castings (including alloys)	288.0*	—	1,238.0	271.0*	—	920.0
Rubber: Reclaimed	0.32	0.34	2.94	0.40	0.41	3.91
Natural (including latex) ...	—	3.05	38.4	—	3.47	138.6
Synthetic	—	0.04	1.69	—	0.04	2.02

* August † Distilling only ‡ May

Caustic Potash and Carbonate

THE Board of Trade announces that caustic potash and carbonate of potash will revert to private trade on January 1, 1950.

Imports will be regulated by individual licences and applications for licences must be made to the Board of Trade, Import Licensing Branch, Romney House, Tufton Street, Westminster, S.W.1, before December 1.

Importers will be expected to purchase from Board of Trade stocks a quantity of material of a corresponding grade at least equal to the quantity for which an import licence application is submitted. Firms not wishing to import may continue to draw on Board of Trade stocks, until these are exhausted.

Relaxing Indian Controls

RELAXATION of control and granting of open general licence for a number of commodities is announced by the Central Government of India in pursuance of the notification of the late Department of Commerce, No. 23 ITC/43 dated July 1, 1943, as continued in force by the Imports and Exports (Control) Act, 1947 (XVIII) of 1947. The goods which may be imported, except from specified countries, include: Industrial exhaust fans and blowers; compressors, air or gas, portable or stationary, but not being imported as part of any spray painting, refrigerating or air conditioning equipment or as a component part; standard technical books for use in connection with scientific research or industrial processes.

CHEMICAL PACKAGING

Progressive Methods on Show in Manchester

THE intimate interest of the chemical and allied industries at the first national Packaging Exhibition, which closes at Manchester to-day (Saturday), is conspicuous. Apart from the packing of pharmaceuticals, for which interesting advances in technique have lately been made, containers for bulk chemicals and many recent developments for their more efficient coating and lining have been offered at the stands of several of the leading firms in this field.

Plastic Membrane

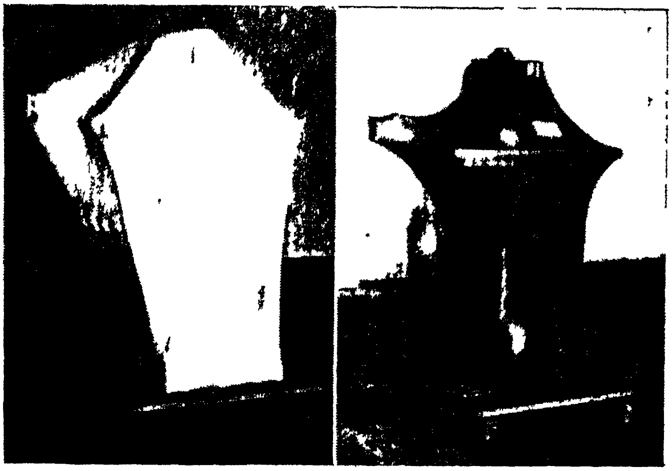
One of the most interesting innovations was that of R. A. Brand & Co., Ltd., whose Cocoon plastic spray protective casing for machinery, etc., regardless of shape or dimensions of the merchandise, is both ingenious and comparatively easy to apply. The plastic used is a vinyl copolymer in ketone solvent and the skin which finally surrounds a machine is sufficiently tough to withstand all the normal knocks and bumping of transportation. Any sharp projections which might pierce the finished coating should be padded with cellulose wadding or with felt, held in place by taping. The placing of a dessicant—usually silica gel—inside the package, after solvent vapours have been allowed to escape, is finding an effective substitute in the Shell vapour phase inhibitor—VPI 260—another recent aid in corrosion-preventive packaging. The Cocoon process has received warm commendation from the Rolls-Royce company.

The makers claim that, using the same plastic, completely successful results have been obtained in the sealing of drums and other containers. It is planned to exploit this use commercially in the near future.

Plastopeel, an anti-corrosive and scratch resisting skin, suitable for cold application to sheet metal and highly polished surfaces, is the product of J. M. Steel & Co., Ltd. It is claimed to be easily removed by stripping.

The numerous uses of Pliofilm in industry were displayed at the stand of the Goodyear Tyre and Rubber Company. Pliofilm linings for bags containing fertilisers are providing good moisture resistance, as a recent commercial undertaking by the company has proved.

Conveyancers, of which a recent model is illustrated in operation—stacking drums for I.C.I.—were the contribution of Electro-Hydraulics, Ltd., Warrington, to the exhibition. This firm is also making interesting developments of existing techniques in transportation, conveyance, safety precautions and other



Two stages in the promising new process for hermetically sealed packaging of machines and instruments, which disregards irregularities of outline: the foundation "cocoon" and (right) the tough plastic envelope, applied as a spray, to which a metallic paint coating may be added to give almost indefinite resistance aspects of international exchange of goods.

The latest improvements in design of Polythene safety jugs, incorporating the welding method of fabrication, were shown by Rediweld, Ltd., which also is offering a widening variety of plastics, valves, sheets, rods, tubing, linings and mouldings.

The new ER interrupted chimb drum, displayed by Reads of Liverpool, is designed to overcome the inherent weakness of many drums of this type by reinforcement at the top joint where the head and side wall are joined by the double-seaming process. In Read's patented method, the drum is drawn with three raised embossings, for ease in stacking, with an inner fold of metal which is drawn back on itself and ultimately lies below the flange required for seaming on to the body. Thus, when the top and the body are joined at the side wall, there is a double thickness of steel reinforcing the four thicknesses of the seam—six thicknesses of steel at the weakest point.

Closure and Pourer

Reads' "Flexspout" closure consists of a metal stamping incorporating a flexible, polythene moulded pouring spout with a protective cover-plate. The fitting is thus guarded from damage in transit. the closure is leakproof, the substantial flexibility of the polythene from which it is moulded acting as a gasket. It can be affixed in one unit by the packer after filling. instead of by the container manufacturer. This is done by means of a simple hand closing tool.

The Flexspout will withstand many times more internal pressure than the container itself, and the U.S. Bureau of Explosives has accepted it for ICC Specifications 17E.

The purpose of the exhibition—to make known the fundamental changes which are taking place in the field of packaging, and especially of export packaging—were commended by Sir Robert Sinclair, president of the FBI, in his speech at the opening. It had long been considered, he observed, that there is a case for providing fuller information on the subject. The reports circulating a year or two ago that some British goods were arriving overseas in a damaged condition could have done serious harm to our trade.

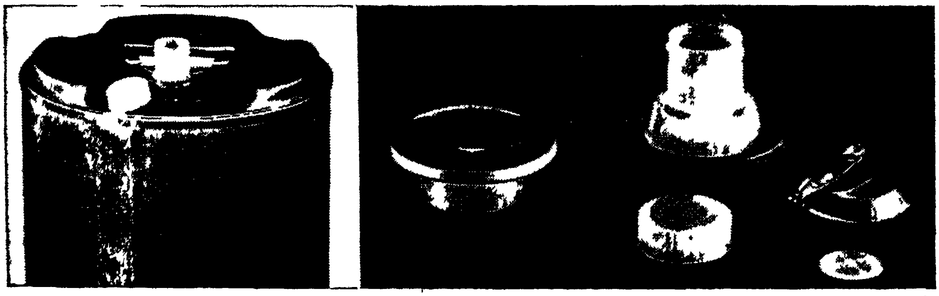
In the U.S.A. the Maritime Association of the Port of New York had recently appointed a packaging engineer to make a test survey of selected shipments; similar action might well be considered in this country. Referring to the importance of specialised research, Sir Robert praised the work of the Institute of Packaging, which sponsored the exhibition, and PATRA, which with laboratories and testing facilities, undertook to answer inquiries about packaging and to direct them to the appropriate technical organisation.

Peat Research Scheme

A survey of Scottish peat bogs and a programme of research into its uses were announced last week by Mr. Arthur Woodburn, Secretary of State for Scotland, at the meeting in Edinburgh of the Scottish Economic Conference.

A committee of scientific and technical experts under the chairmanship of Sir Edward Appleton, Principal of Edinburgh University, has been set up. Its terms of reference include investigation of methods of winning and handling peat; research into the burning of peat in gas turbines for the production of electric power.

Preliminary work on the development of a closed-cycle turbine to burn peat has already been made by the John Brown organisation, of Clydebank.



By courtesy of Reads of Liverpool

The Flexspout closure in use and its components

CHEMICAL RISKS AND SAFEGUARDS

Contributory Factors Reviewed at Scarborough

THE second conference discussing safety in chemical works, organised on behalf of the Association of British Chemical Manufacturers by the Royal Society for the Prevention of Accidents, was held at the Royal Hotel, Scarborough, from Friday to Sunday, October 7-9.

Mr. J. Davidson Pratt, director and secretary of the ABCM, presided throughout the conference, and extended a welcome to a number of visitors from overseas—Dr. H. A. J. Pieters (Dutch State Mines), Mons. A. Vallaud (Institute of National Security, France), Mr. W. H. Coulson and Mr. H. D. Bower (Australian Munitions Delegation, London).

Sir Harry Jephcott, ABCM chairman, in an introductory address, mentioned examples of hazards which could occur in chemical industries and their elimination by careful thought and appropriate action. He mentioned also the new industrial hygiene laboratory set up by Imperial Chemical Industries, Ltd., the directors of which had stated that it was intended that the results of the work there should be made available to chemical industry as a whole.

The chairman directed attention again to the overriding need to do all that was possible to eliminate the dangers which may arise when products of the chemical industry are in the hands of users having little appreciation of the potentialities of the material.

Toxicity of Solvents

The first paper before the conference was by Dr. Arthur J. Amor, president of the Association of Industrial Medical Officers, and Chief Medical Officer of I.C.I., Ltd. The information it contained, derived in part from Henderson & Haggard's "Noxious Gases," and the Medical Research Council's "Toxicity of Industrial Organic Solvents," threw light on the properties of solvents, their effects on human beings and the treatment of victims.

In the 10-year period 1939-1948, 12 cases of chronic benzene poisoning, eight of which were fatal and 20 cases of toxic anæmia due to benzene, five of which caused deaths, were reported to the Chief Inspector of Factories. The incidence of gassing accidents caused by substances used as solvents was indicated by a table, showing that in the same 10-year period 519 such accidents were reported, and 31 of the affected persons died. Dr. Amor considered it reflected very well on chemical industry, and perhaps on the user industries as well, that in the use of such substances our casualty rate and our death rate had been so small; it was conceivable that in the next 10-year period the rate might be reduced almost to zero.

Trichlorethylene

The paper went on to discuss safety precautions, physiological and pathological aspects and the treatment of workers affected by solvents. Twelve groups of solvents, arranged on a chemical structure basis were discussed. Of 24 solvents included in the group of halogenated compounds, 7 were included in the list of gassing accidents due to solvents, and they accounted for 422 accidents, with 14 deaths, in the 10-year period. The majority of cases of poisoning and death, said the author, were due to trichlorethylene and carbon tetrachloride; that group was undoubtedly the most important of all the solvents, and the very large number of recorded accidents was due to their extensive industrial manufacture and use.

Perhaps the most important member of the group was trichlorethylene. During recent years pure trichlorethylene had been used on an increasing scale as a general anæsthetic, which helped to establish its safety when properly used.

In the subsequent discussion, emphasis was laid again on the user angle, it being pointed out that the chemical manufacturers *must* make their products safely. It was pointed out by Mr. Davidson Pratt that chemical manufacturers warned their customers about the dangers associated with products and indicated the precautions to be taken in their handling; trouble might arise from the fact that many products passed through the hands of intermediaries.

Dr. Amor urged that inquiries concerning problems arising from new products should be sent to the Medical Research Council. Mr. Davidson Pratt added that the ABCM would be glad to help.

The permissible electrical apparatus for use in hazardous atmospheres was dealt with in a paper by Mr. S. W. Richards, of the General Electric Company. In the author's absence, owing to illness, the paper was read by his colleague, Mr. G. A. Bowd.

Attention was directed first to situations where permissible apparatus (tested and certificated by a responsible Government department as being suitable for use in specified conditions) should be used. He referred to the American National Electrical Code which gave classes or locations in which were inflammable volatile liquids, gases, dusts, fibres, etc.

Presumably, he said, the authorities in this country would in due course give a similar lead to industrial users. There were as yet no clear directions, particularly with respect to dust and fibre risks. It was permissible, therefore, to accept the American Code, giving a clear idea where permissible apparatus should be used

There had, however, been considerable research here on dangers from gas explosion, and the testing branch of the Ministry of Fuel and Power had classified the inflammable gases into four groups. The author tabulated those groups, with some added data on flashpoint, etc.

Gases and Liquids

Group	Gas or Liquid	Flash Point Deg. F.	Ignition Temp. Deg. F	Explosive Limits per cent. in air Lower	Upper
I	Methane	Gas	1285	5.3	14
II	Blast furnace gas	Gas	1012	14.0	68
	Pentane	Gas	960	1.4	7.8
	Hexane	Gas	932	1.2	6.9
	Heptane	Gas	500	1.0	6.0
	Octane	Gas	480	0.95	—
	Decane	Gas	465	0.7	—
	Propane	Gas	1060	2.4	9.5
	Butane	Gas	805	1.85	6.4
	Benzene	0	475	1.4	6.7
	Xylene	63	820	1.0	6.0
	Acetone	—2	825	2.5	13.0
	Ethylene	Gas	1008	3.0	29.0
	Amyl acetate	90	860	1.2	—
	Ethyl acetate	24	875	2.0	8.0
	Methyl acetate	3	820	3.1	15.5
	Butyl acetate	76	692	1.7	—
	Propyl acetate	57	860	2.0	8.0
	Methyl ethyl ketone	13	755	1.8	10.0
	Amyl alcohol	70	880	1.2	—
	Butyl alcohol	111	792	1.7	18.0
	Ethyl alcohol	50	980	3.5	19.0
	Methyl alcohol	30	912	7.3	36.0
	Ethyl ether	0	356	1.9	22.0
III	Towns gas 57 per cent Hyd.	Gas	1180	5.5	31.0
	Coke oven gas 55 per cent Hyd.	Gas	1200	5.3	35.0
IV	Excluded Gases and Vapours				
	Acetylene	—	Maximum safe gap too		
	Carbon disulphide	—	small to be practicable		
	Hydrogen	—	for the class of apparatus		
	Ethyl nitrate	—	to which flame-		
		—	proof enclosure is		
		—	commonly applied.		

A clear line of distinction must be observed when considering the relative dangers of gases and dusts and fibres. Dealing with gases alone, by far the safest measure was to provide sufficient air change so that the gas concentration was always below the ignitable or explosive limit. With dusts and fibres, however, the greater amount of air (and thus oxygen) supplied, the more complete and perfect the combustion of the airborne material.

Those two conditions were considered separately in the author's subsequent discussion of appropriate apparatus, and he illustrated various examples of permissible or certificated apparatus—switchgear, sealing arrangements, lamps, etc.—which generally could be regarded as flameproof, intrinsically safe, and approved.

The electrical inspectors of factories, he concluded, were continuously obtaining valuable experience and knowledge in the subject, and it was strongly recommended that all appropriate schemes should be submitted to the local inspector for his opinion. In conjunction with the research laboratories, etc., of the large manufacturers they were continually probing new problems and finding new solutions.

The present trend seemed to be that internationally we should in the near future arrive at some common basis for protective ideas and methods of testing for permissible equipment. A committee, in fact, had been formed to deal with the matter.

Breathing Apparatus

The final session, on Sunday morning, considered a paper by Mr. T. Senior (I.C.I., Ltd.) dealing with breathing apparatus from the points of view of installation, maintenance and training. He dismissed as indefensible the old idea that " risks must be run if production is to be maintained," and urged that the majority of the hazards and dangers arising in everyday work should be foreseen and, therefore, could be guarded against.

No amount of planned maintenance, however, could provide a safeguard against hazards which arose without warning under the stress of emergencies. Such emergencies, however, could be foreseen, and arrangements could be made in advance to meet them. That constituted the second line of defence, and all safety appliances fell properly into that second category.

All types of safety appliances for personal protection should be considered an emergency protection only and never considered an essential in the ordinary routine of a process or maintenance job.

(*continued overleaf*)

STEAM-JACKETED PANS

Revision of British Standard Specification

A REVIEW of characteristics of cast iron and enamelled cast iron steam-jacketed open-top pans for the chemical and allied industries has been undertaken by the Chemical Engineering Industry Standards Committee, and a revised edition of the original British Standard specification, first published in 1923, has now been published by the British Standards Institution as B.S. 186: 1949.

The committee found that there was little demand for sizes of 75 gal. working capacity, shallow type, and 150 and 200 gal. working capacity, deep type, and these have consequently been omitted from the revised standard.

Pans in general were operated at a jacket working pressure within the range of 1-40 lb./sq. in. Jacket working pressures of 35 lb./sq. in. for Class A, and 45 lb./sq. in. for Class B, have therefore been replaced by one pressure, *viz.*, 40 lb./sq. in.

Attention is directed to the following revision of the details of the original standard:—

The grade of cast iron for enamelled pans is now specified as B.S. 1452, Grade 10.

In view of the variety of purposes for which enamelled cast iron pans are used and the diversity of opinion regarding satisfactory methods of testing enamel coatings, the precise nature of this test is left to be agreed between the purchaser and manufacturer.

The position regarding bolts and nuts is at present difficult, in that the latest standard for bolts and nuts (B.S. 916) provides only for the smaller hexagon head, whereas there are cases where the larger hexagon bolt is preferred for this type of pan.

The supply of the larger hexagon head may have an important bearing in some cases, and it was decided that, at this stage, this new clause should contain cross reference to B.S. 196 and, at the same time, give freedom of action to those who wish to use the larger hexagon head.

The previously stipulated test duration of two minutes at full hydraulic test pressure has proved inadequate. This has been amended to 30 minutes.

The hydraulic test pressures of 75 lb./sq. in (Class A) and 90 lb./sq. in. (Class B) are replaced by one hydraulic test pressure of 80 lb./sq. in.

The steam test is now deleted, the amended hydraulic test being considered adequate.

Shallow and deep type pans are illustrated by sectional diagrams, and there are tables setting out the details of the inner liner and outer jacket for both types.

CHEMICAL RISKS AND SAFEGUARDS

(*continued from previous page*)

Should the constant use of such appliances be necessary, then the plant should be examined and the technical remedy applied; and he emphasised throughout that improvements effected to ensure the safety of the operatives frequently resulted in greatly improved production.

Mr. Senior exhibited many types of apparatus and discussed their features, the conditions in which they should be used, their routine inspection and maintenance. He discussed also training in their use, and said he had found it necessary to train the plant operators, also the key men in the maintenance section, in addition to all works firemen. and he gave an outline of a 6-hour initial training course.

A number of important principles were laid down, such as the basic conditions for the successful use of canister masks and for short distance breathing apparatus, indispensable for tank cleaning and similar work. In the latter connection, it was strongly recommended that no more than 30 ft. of ¾-in. internal diameter tubing should be employed without incorporating a bellows. The 60 ft. maximum sometimes recommended was not considered safe.

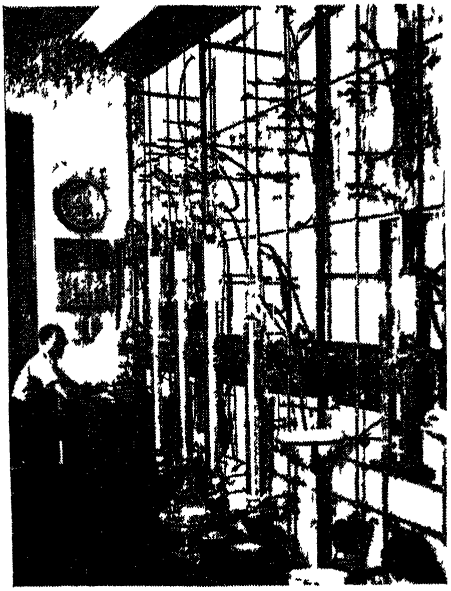
As regarded the canister mask, it was urged that a record card should be kept with each mask to enable the wearer to record the length of time it was worn.

On approaching the life given by the makers, which in nearly all cases is 30 minutes in a 1 per cent concentration, the canister must be renewed.

The canister mask should on no account be used for work: (1) In enclosed vessels or spaces, (2) where the oxygen content is low, (3) where a concentration is likely to exceed 1 per cent, (4) with an unsuitable canister, (5) with an exhausted canister.

Equipping a

Flexibility and



NOTEWORTHY advances in the design and equipment of a chemical research centre are conspicuous in the laboratory unit which has just been opened by the Carbide and Carbon Chemicals Corporation on a 140-acre tract near the company's South Charleston, West Virginia, plant. When entirely completed, the new laboratories will be the centre of the company's research operations in organic chemicals and resins, concentrating on the development of new plasticisers, new synthetic resins, and new organic chemicals for agricultural and other uses.

14 Service Lines

The laboratories reveal a number of unusual and promising ideas, including ingenious supports in each laboratory which permit complete versatility in the location of laboratory furniture and equipment. Each laboratory can draw on any one of 14 separate services from permanent outlets, including such supplies as cold brine, oxygen, hydrogen, nitrogen, and steam at either 15 or 200 p.s.i.

The laboratory building itself is designed as a three-storey T-shaped structure of steel and brick, 325 ft. long, 96 ft. deep. It contains 69 individual laboratories and 48 offices, a large-scale laboratory, a large library, an auditorium seating 125, and necessary storage and service rooms. Already operating are a 40,000 lb. per hour steam plant, a maintenance and equipment fabricating shop, and a cooling tower, all connected by subways carrying utility lines.

Novel Mechanical Features

Complete air conditioning, vibration absorption, a great number of safety appliances, fluorescent lighting providing an average of 40 foot-candles at all working levels, and very modern laboratory services and furnishings are among the factors making for the comfort and safety of those who work there.

Flexibility to permit ease of rearrangement and extensions, was the keynote of the laboratory design. Individual laboratories were therefore designed as repetitive units in 13 ft. wide sections. This establishes adaptability with a choice of room width of 13, 26, or 39 ft., the maximum required. The depth of laboratory rooms was set at 24 ft., to accommodate multiples of standard 3-ft. sections of laboratory furniture. The standard 13 by 24 ft. room accommodates two or three workers and may be equipped with any combination of laboratory furniture. All laboratories range along one wall of the building, which simplifies, with maximum economy, all service piping and exhaust duct installations.

In addition to the usual and exceptional services supplied to each bench, all the laboratories are supplied with outlets for 110 volt a.c. with built-in variable voltage control for controlled heating. Provision has also been made, wherever needed, for installing 200 lb. steam, oxygen, and hydrogen, as well as 220 volt a.c. Outlets for connections to laboratory apparatus are located at the rear of each bench to permit removal of the furniture without disturbing the service lines.

All service supply lines extend through vertical shafts from main headers in the basement at each bay, and connections are made at each floor to permit horizontal run-outs. From the horizontal lines, branches to the service strips at the rear and above the laboratory benches, to hoods, to distillation areas, and to sinks run either along the partition walls or in recesses in the floor. Covered floor recesses and other enclosures are all easily accessible. Access doors to the

U.S. Laboratory

Ample Services

vertical shafts are located in the corridors, so that in case of emergency the main services can be shut off at once.

Air supply at a maximum of 80 F. and 50 per cent relative humidity in the summer and at a minimum of 70°F. and 25 per cent humidity in the winter is maintained by a 600-ton refrigeration unit, and incoming air is cleaned by electrostatic precipitators. Each room has a thermostat for individual temperature control and one laboratory room is specially equipped to provide constant temperature and humidity conditions.

Most of the laboratories are equipped with fume hoods. Since the operation of a fume hood requires much more air than can be economically supplied from the conditioning system, each hood has an independent supply of clean air. When a hood is placed in operation, the air supply duct is opened and the exhaust fan speed is doubled. One switch actuates this.

Vertical duct systems for air conditioning and fume hood exhausts are all located in the centre of the building adjacent to columns. In this fashion, duct-work is unobtrusive.

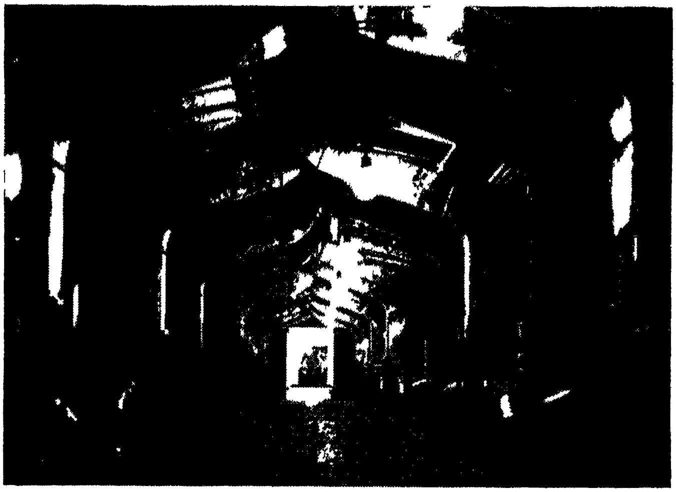
The physical testing equipment includes, in addition to the usual equipment, an electron-microscope, a mass spectrometer, a vacuum coating unit for electron-micrographs, an X-ray diffraction unit, a microdensitometer, and ultra-violet and infrared spectrometers.

Safety Devices

Safety has received careful consideration. Apart from the air conditioning system, the basement and pipe shafts are continuously purged by exhaust fans located in the penthouse. The doors from the laboratories to the 100-yard long corridor are double hung and swing outward; and at the opposite end of each laboratory is an escape door to the adjoining room. The stair wells and exit doors are so located that it is possible to leave by at least two routes from any point in the building. There are elaborate carbon dioxide fire extinguishing systems and an automatic alarm system.

High-Pressure Laboratory

Investigation of chemical reactions at extreme pressures is an important part of the research programme. For this, a separate high-pressure laboratory building is located at the back of the plot. High-pressure equipment is housed in individual cells facing a high earth bank. An 18-in. reinforced concrete barrier separates the control corridor from the cells. In front of the control corridor are laboratory and work rooms. The partition walls between cells are made of two $\frac{3}{4}$-in. steel plates separated by 3 in. of sand. Access to the cells is provided by aisles so arranged that equipment that is out of service can be reached for servicing without passing in front of any equipment that may be operating.



The considerable engineering work involved in providing liberal exhausting equipment in all laboratories is indicated by this view of the duct assemblies, forming one of two such wings on the fourth floor. Depicted on the facing page is an example of the large adaptable laboratory assemblies

CHOICE OF THERMOSTATIC CONTROLLERS

*Responsibility of the Plant Engineer**

by LEO WALTER, A.M.I.Mech.E., A.M.I.H.V.E., M.Inst.F., etc.

THE matching of controller characteristics and process characteristics is not easy and care is required to produce the most satisfactory results. The problem is made no easier by the absence of hard and fast rules; too many factors influence the final choice of a controller type.

The first quality of a temperature controller should be simplicity and reliability. The choice of type depends to a great extent on the availability of service and of maintenance facilities at the place where it is to be used. It is obvious that the finest controller becomes useless, if it is neglected and has to work in dirty surroundings under adverse conditions.

Neither the user nor the maker of a thermostat should decide independently which regulator type should be used. Just as process equipment and controller have to work together, so have the maker and the user to consult and establish what exactly will be the details of working conditions of process and of instrument.

Regulator Types

Many prospective users of temperature regulators either have their own ideas about the controller type to be installed, or do not realise the absolute necessity to give the instrument maker correct information on the subject of working conditions. A few appear even not to know very clearly how their plant works from the heating point of view. To be preoccupied almost exclusively with output is understandable, but does not help in process analysis, which is a preliminary requisite to fitting an automatic regulator.

The first step to be taken by the user who is considering automatic control, is to give full information on process characteristics to the maker of thermostats. This requires the provision of such data as the process's heat demand, the heat supply, the capacities, and the closeness of control which is achievable, *i.e.*, controllability of the process.

Makers of thermostats usually have questionnaires available. and it is occasionally desirable that some experiments should be performed on the plant, such as measuring the condensate or the steam in-put for direct steam injection, thus ascertaining the rate of flow of the heating medium or of cooling liquid, or by measuring the wattage of an electric heating current.

After such preliminary investigation of all the process characteristics, which influence the choice of controller type and the achievable closeness of control, the makers of thermostats will submit their recommendations, conditioned by their own experience and their range of suitable instruments.

The ultimate choice will, of course, still rest with the plant engineer, who has the responsibility for the job, but he would be well advised not to attach undue weight to the financial side of the business of installing a controller. Expenditure is generally not so large as to warrant sacrificing much more important features of a controller. Running expenses for maintenance, repairs, etc., continue during the lifetime of the controller and can be much more important, if the device has been bad, than the original cost.

One of the main questions which occupies the user's mind is, "How closely will a temperature regulator control the temperature?" No direct answer obviously can be given without an intimate knowledge of the plant characteristics, as we have shown. Even after a thorough investigation of the process equipment and its working conditions, or of the space heating installation, the answer can only be approximate, based on experience with similar control problems.

Temperature Change

Control at a fixed temperature without any fluctuation, a condition which has been known to be specified frequently, is an impossibility, as some degree of temperature change must be allowed by the user in order to enable the thermostat to operate at all. The user of a temperature regulator should therefore keep his demands regarding accuracy within reasonable limits, and certainly within the limits imposed by controllability of the process. Fig. 3 shows the use of a controller on a fractionating column—an application which is frequently difficult, and usually requires rest or rate controller types.

Another primary consideration is

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* The first part of this article appeared in our issue of September 17, p 389-393.

whether a non-indicating, an indicating or a recording controller type should be used. The answer depends partly on the type of process to be controlled, partly on financial considerations and, not least, on the possibility of maintenance and supervision available.

The general rule—it has been said before—should always be to use the simplest design which will do the job and provide a reasonable closeness of control. Where the process is sufficiently important to warrant the expenditure of recording temperature, an electrically or pneumatically operated recorder-controller should be installed. Where a thermometer has already been fitted, a non-indicating regulator can be used, and many plant engineers prefer to fit an independent thermometer.

Whether an On/Off controller type should be used or a gradual controller type is usually decided by the maker of the thermostat, after investigating the working conditions of the process and taking into consideration the intentions of the user.

Users of thermostats should, of course, know *why* a special controller type is being recommended. Here, then, are the reasons why in one instance an On/Off type was to be put forward, and in another a more or less elaborate gradual controller.

The process properties influencing the choice of controller are in general:—

(1) Variations in quality and mass of the heating or cooling medium—is the heat supply steady or fluctuating? While these "external" process characteristics should be kept as uniform as possible, working conditions are sometimes adverse, *i.e.*, fluctuating gas supply pressure to a furnace burner.

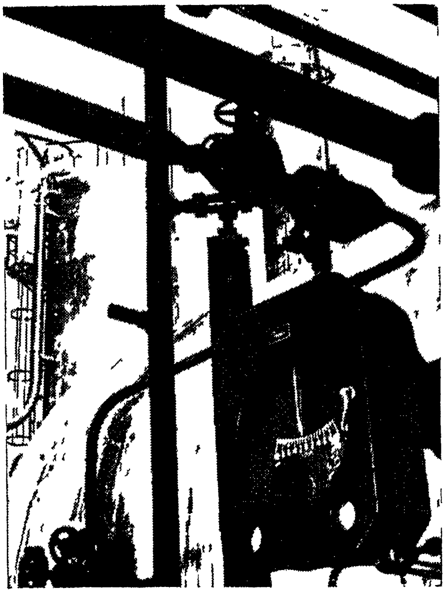
(2) Is the demand side capacity reasonably steady?

Process Temperatures

(3) What are the process time lags? Does a change of heat input take relatively long to produce a change in temperature, or are process lags small? Such process reaction rate influences the ultimate controller choice.

(4) What degree of self-regulation can be expected? This is a question, which can often be answered by a little experimentation with hand control, simply by studying and tabulating the reaction of the process to successive alterations of heat input.

(5) Ratio of supply side capacity to demand side capacity. The design of the plant, and sometimes measurements, provide the answer to this important factor of temperature control.



[Courtesy of Taylor Instrument Co, Rochester, N.Y.

Fig. 3. Pneumatic indicator-controller fitted to fractionating column in oil plant

(6) "Controllability of a process." This term is connected with the more or less correct ratio of capacities and it is sometimes possible to improve controllability by making alterations in design of the plant (heat exchanger). Increasing the rate of heat transfer, for example, introducing a more rigorous movement of the heating medium, or by enlarging the heating surface (bigger steam coil), etc., may achieve that result.

Some instances may be cited in which temperature control is more difficult:

(a) *Very large supply side capacity.*

An example of this is the liquid cooler design (Fig. 4) of which the heating surface and amount of heat available can easily become disproportionate to the absorbing capacity of the thin film of liquid (milk) flowing over the heating surface. Obviously, the ratio between demand side and supply capacity is very unfavourable for thermostatic control, although the design of the apparatus is very good for output under very steady conditions.

Another example of oversized supply side capacity is an instantaneous water heater of the tube and shell type, where

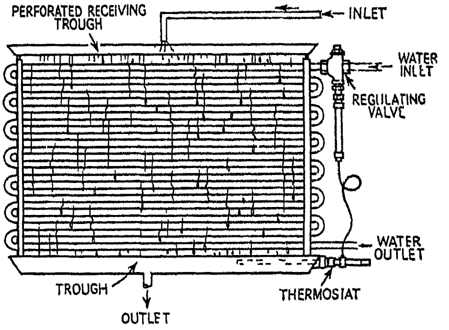


Fig. 4. Liquid cooler having unfavourable control characteristics

a relatively large heating surface must be packed into the apparatus to afford sufficient heat input. The heat transfer surface obviously has to be calculated for the maximum possible rate of flow of water and the heating surface will thus be oversized for minimum flow (throttled outlet). There will be little accuracy of control.

Fig. 5 illustrates capacity ratios, which are: (1) favourable for a large hot water storage calorifier; (2) moderately good for a shell type steam-water heater, and (3) very unfavourable for a direct steam-water mixer.

(b) *Very slow rate of heat transfer.*

Even a quick response of a controller will become less efficient if, for example, a variation of heat load cannot be counteracted quickly enough, because the re-establishment of heat balance is delayed by a sluggish heat transfer in the exchanger. Thick walls of heating coils, an insulating deposit on heating surfaces, bad heat distribution and other factors may have a detrimental effect on closeness of control, and great deviations of process temperature would have to be tolerated, in spite of a quick-acting thermostat.

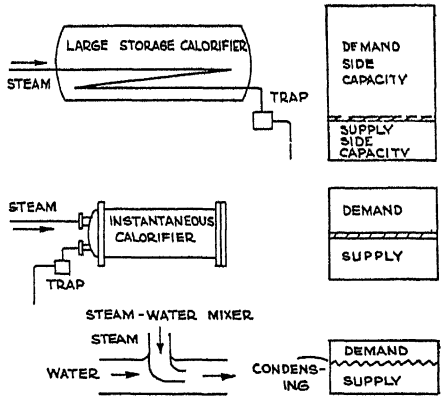


Fig. 5. Capacity ratios for various heat exchangers

A pyrometer controller, fitted on a large oil-fired industrial furnace actuates a motorised unit, which adjusts simultaneously the fuel-oil and the air supply valves at a preset fuel/air ratio. Although the controller time lag is very small, considerable time will elapse before a change in the rate of oil plus air supply will alter furnace temperature, because of the great residual heat of the brickwork of the furnace and its enormous heat demand side capacity.

(c) *Relatively small demand side capacity.*

This is, of course, related to (a) and can be caused by too slow a flow of material to be heated. An increase of rate of flow on the heat demand side of the heat exchanger might improve matters or, a slight reduction of heating surface and heat transfer might cure some undesirable process properties.

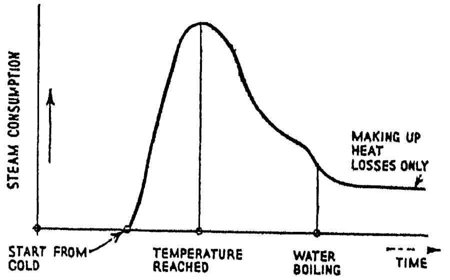


Fig. 6. Steam consumption of steam-heated dye vat

There are, of course, instances of varying load, where the demand side capacity (largely the heat absorbing quality of the heated or cooled substance) is in proportion to the heat input at the *beginning* of the process, but becomes smaller as the process goes on.

A good example is the heating of a dye-vat, in which the big temperature difference when heating up from cold creates a heavy starting heat load, as shown in Fig. 6. The nearer the liquor approaches boiling point, the smaller becomes its capacity for heat absorption. This is much more pronounced in dye vessels with comparatively small liquor volume (relative to rate of heat input) than with large vats.

Another example, where an apparatus has been designed for full load, but in practice the load varies and may become dangerously small (thus creating a small demand side capacity) is a drying oven, using hot air, and drying shelves.

Fig. 7 illustrates diagrammatically a dryer type with three banks of heating coils and a circulation fan. It depends very much on actual heat load, *i.e.*, on number of loaded shelves, whether control will be satisfactory, or drying temperature will be irregular in the absence of a control mechanism. This and similar types of batch dryers should be operated preferably with full capacity load.

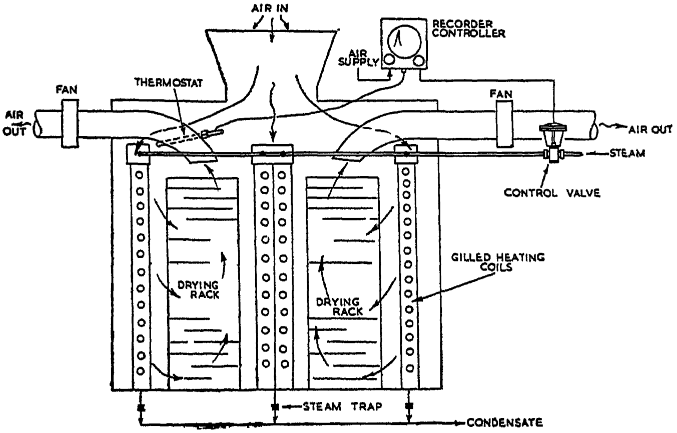


Fig. 7. Hot air dryer with three banks of heating coils controlled by pneumatic recorder-controller thermostat

(d) *Where process lags in general are big.*

This is to some extent a condition, even worse than (b), because not only is the heat transfer likely to be sluggish, but there may be other process time lags. The distribution of heat on the demand side may, for example, not be as good as desired, or the temperature difference between heating medium and heated substance may be very small and retard heat transfer.

When considering distribution of heat on the demand side, it should be realised that the shape of vessel containing the heated liquid will have some effect on process lags.

A typical case is an oil storage tank having a steam coil of ample dimensions, which might prove quite a difficult subject for automatic temperature control. (Fig. 8.) Stratification of oil temperature commonly takes place, and correct location of the thermostat bulb may be difficult. This has sometimes to be determined by trial and error. In storage vessels without stirrers or pumps it cannot always be foreseen, how heat distribution will occur, in spite of the obvious fact that the hottest layers of oil should be on top of the vessel.

A similar difficulty may arise with very large bulk oil storage tanks in which the heating surface has been provided in the form of very long heating coils. The latter cause waterlogging of a great part of the heating surface and the consequent erratic function of steam traps, and very bad heat distribution. Splitting up of the steam coils into individually trapped and air vented sections reduces distribution lag (spirax system), and improves control.

It is therefore obvious that bad distribution of heating surface may increase the process lag considerably, although the heating surface itself may be big enough. Undersized heating surfaces also will obviously be detrimental to temperature control.

The same factor applies, of course, to means of heat input, whether pipes for steam or hot water, gas, etc., or electrical cables for resistance heating, which

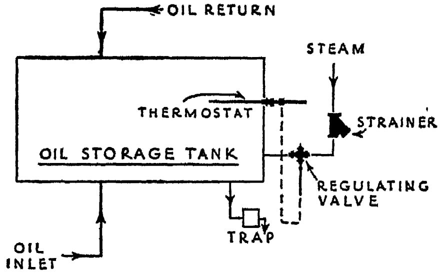


Fig. 8. Steam control of coil-heated large oil storage tank

offer excessive resistance to heat flow in the supply side.

(e) *Bad location of heat-sensitive device.* The use of thermometers in industrial processes is widespread and the general rules of correct thermometry apply usually to thermostatic control. It is impossible to enumerate all difficulties which may be encountered in placing a thermostat correctly, but the general rule is, that the thermostat bulb must be located where it can best record average temperature and be able to react as quickly as possible to changes. "Dead-spots" or "cold-spots" should be avoided, such as a location in space heating, where the sun could shine on the thermostat or where draught from open doors or windows would have an adverse effect (Fig. 9), although outdoor installations have sometimes to be tolerated.

There is one point, however, in which automatic temperature control may differ from temperature measurement. Whereas an indicating or recording thermometer must have its temperature-sensitive portion located where it can react to the actual temperature, automatic temperature control sometimes is actuated by a related temperature. This will be all right, as long as there is a constant and fixed relation between the correct process temperature and the related indirect one.

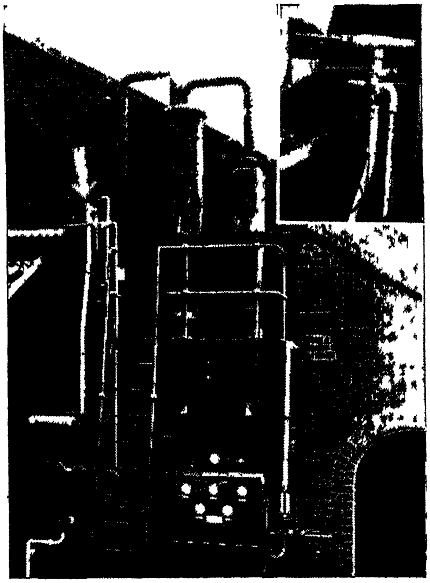
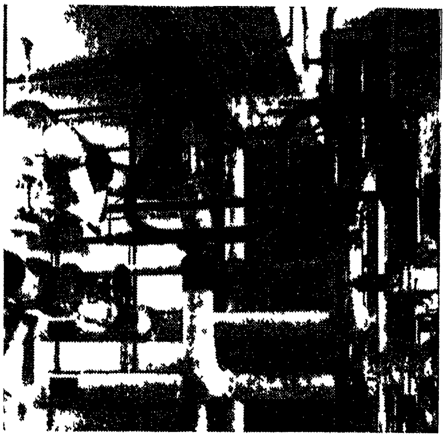


Fig. 9.—Thermostat and control valve placed outdoors on benzol recovery plant



[Courtesy of Biddy & Sons, Ltd.

Fig. 10. *Thermostat bulb-fitted in swan neck of cooling water outflow*

Examples for such "indirect" location of thermostats are control of vapour temperature in a still by detecting temperature changes in the liquor being drawn off, or the placing of a thermostat bulb in the cooling water outflow from a chemical condenser, as shown in Fig. 10.

The controlled heating substance may be a highly corrosive liquid, making it inconvenient to place the thermostat bulb or thermocouple in the liquor. Temperature of the cooling water outflow will, however, be strictly proportional to liquor temperature, and so can be used for indirect control.

It should be noted that indicating or recording thermometer-controllers should avoid such indirect location of the bulb, unless precautions are taken to ensure correct readings, in spite of remote location of bulb.

(*To be continued*)

Adapting War-Time Research

THE importance of applying the technique of war-time operational research to peace-time conditions in British industry will be the subject of a series of six meetings organised by the Manchester Joint Research Council.

The meetings, to be held fortnightly on Friday mornings at 11.30 a.m., in the board room of the Manchester Chamber of Commerce, will be addressed by well-known authorities.

An open forum will be held at the final meeting, when the series of discussions will be summed up by Sir E. Raymond Street, and Prof. P. M. S. Blackett.

THE COLORIMETRIC DETERMINATION OF BISMUTH

Russian Comparison of Iodide, Thiocyanate and Thiourea

THE most useful colorimetric methods of determining bismuth are the iodide, the thiourea, and the thiocyanate methods. The first, based on the reaction of bismuth salts with potassium iodide to give a yellow or orange colour, is the best known, but the published methods suffer from certain disadvantages especially when interfering metals are present. The other two methods have hitherto received scant attention.

The object of the present work* is to study the various factors involved in the differing methods and to indicate improvements.

Iodide Method

By means of a differential photocolorimeter with violet colour filters (4000-4700 A.) the light absorption of various solutions was obtained. With 0.4 to 18 mg. per litre of bismuth in 5 per cent sulphuric acid containing 2 per cent of potassium iodide, it was found that Beer's law held good within the range 0.4 to 12 mg. per litre of bismuth. The sensitivity is 8 × 10^{-2} μg of bismuth per sq. cm. (This method of expressing concentrations in work with a photocolorimeter is preferred to the normal method of quoting volume concentration, since the latter has no meaning unless the thickness of the layer of solution is stated; the volume concentration is obtained by dividing by the width of the cell). The relative error of a determination does not exceed 1 per cent in the range 2.6 to 18 μg. per sq. cm.

Interference is caused by various elements. Antimony gives a colour similar to that given by bismuth, but its intensity depends on the acid concentration. Thus, in the presence of 2 per cent of potassium iodide, the colour intensity in 0.9 N sulphuric acid is insignificant with as much as 100 mg. per litre of antimony. but it develops in 1.8 N acid, although even then the intensity of the iodo-antimony complex is less than one-fiftieth of that of the bismuth complex obtained at a similar concentration.

With larger amounts of antimony the addition of sodium fluoride or sodium tartrate prevents the appearance of colour due to this element, while these reagents have no effect on the development of the colour due to bismuth.

Certain other elements interfere by liberating iodine from the potassium iodide. It is usually recommended in these cases to add sulphur dioxide to reduce the iodine, but this method is unsatisfactory, since it is known that sulphur dioxide and iodine react in acid solution to give a yellow colour.

Other workers have suggested hypophosphite or stannous chloride for removing the iodine. The reagent now recommended is thiourea. This substance is itself used for colorimetric determination of bismuth under certain conditions (see below) but tests showed that the small amount required to be added in excess to ensure the reduction of the iodine has no effect on the colour intensity of the bismuth iodide. Furthermore, it gives a colourless compound with copper, and hence considerable amounts of this element will not cause interference.

Tests were carried out with mixtures of copper (200 mg./l.), iron (400 mg./l.), arsenic (16 mg./l.), and antimony (100 mg./l.), since bismuth is usually separated by co-precipitation with ferric hydroxide in the analysis of non-ferrous metals, and the elements named are those likely to accompany the bismuth.

The photometer readings were the same as with a blank test, except that the presence of antimony required the addition also of sodium fluoride as indicated above. Lead must be removed.

Thiourea

Tests with various concentrations of nitric acid in solutions containing 4 mg. per litre of bismuth and 1 per cent of thiourea showed that no effect was produced by changing the acid concentration within the range 0.4 to 1.2 N; above 1.2 N the colour intensity was decreased.

Further tests with various concentrations of thiourea between 1 and 10 per cent in solutions containing up to 4 mg. per litre of bismuth and 0.5 N in nitric acid, showed that, although the colour intensity increased with increasing content of thiourea, at any definite concentration of thiourea there was strict proportionality between the colour intensity and the bismuth content. In the presence of lead, however, thiourea in concentrations of over 2 per cent gives a precipitate, hence it is desirable to keep the thiourea concentration to 1 per cent or below.

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* A. I. Kokorin and N. G Dermanova, *Zavod. Lab.*, 1946, *12*, 59; *Analyst*, 1947, 72, 265.

Tests carried out in the presence of lead showed that in 0.5 N nitric acid containing 1 per cent thiourea the colour intensity decreases with increase in the lead concentration, but that at any given lead concentration the colour intensity is strictly proportional to the bismuth concentration. Thus, the effect of lead is merely to alter the slope of the calibration curve. Calibration curves were therefore constructed for bismuth concentrations applicable to various concentrations of lead in the test solutions.

Photocolorimeter tests were carried out on solutions of 0.5 N nitric acid containing 1 per cent of thiourea and bismuth concentrations between 1 and 16 mg. per litre (these figures, with 13 mm. cells correspond to 1.3 to 20.8 μg. per sq. cm.). The sensitivity in absence of lead was 19×10^{-2} μg., and in the presence of 0.5 g. in 50 ml., was 22×10^{-2} μg. per sq. cm. Beer's law operates within the range 2 to 16 mg. per litre.

Method	Medium	Sensitivity μg./sq. cm.	Beer's law range mg./l.	Useful range μg./sq. cm. Error <0.8%	Useful range μg./sq. cm. Error <1%	Stability, hours
Iodide	H_2SO_4 1—2N	8×10^{-2}	0.4—12	5—10	2.6 -13.5	3—4
Thiocyanate	H_2SO_4 1—3.5N	11×10^{-2}	0.8—8	9—13	6-20	1.5
Thiourea	HNO_3 0.4—1.2N	22×10^{-2}	2—16	10—15	5.2—20	1.5

The relative error does not exceed 1 per cent in the range 5 to 26 μg. per sq. cm. in absence of lead, and in the range 7.8 to 21 μg. per sq. cm. in presence of 0.5 g. of lead per 50 ml. The colour of the bismuth-thiourea complex attains its maximum intensity immediately and is stable for 1.5 hours. A cloudiness starts to develop after that time.

The presence of antimony has a slight effect due to the formation of a coloured antimony-thiourea complex, but this can be prevented by the addition of sodium fluoride. The latter, however, in the presence of lead gives a precipitate that interferes. The addition of tartaric acid is to be recommended when lead is present.

The following procedure is satisfactory for the determination of amounts of the order of 0.02 to 0.07 per cent of bismuth in metallic lead:—

Dissolve 1 g. of lead by heating with 15 ml. of dilute nitric acid (1:9), add 20 ml. of water, 1 g. of tartaric acid, and 10 ml. of 5 per cent thiourea solution. Transfer to a 50-ml. graduated flask or cylinder, make up to the mark with water, mix, transfer some of the solution to a photocolorimeter cell, and measure the light absorption, using a violet filter (4000 A.), and, for the null solution, a solution similarly prepared, but without the thiourea. Calculate the bismuth content from a calibration curve, obtained by measuring the absorption of a series of solutions containing lead, as nitrate, in the same concentration as that of the test, but with varying amounts of bismuth.

In dilute sulphuric acid solution and in the presence of a large excess of thiocyanate, bismuth gives a lemon-yellow colour. The reaction has been studied recently by Kokorin and Dermanova who found that the acidity should preferably be kept within the range 1 to 3.5 N, and the thiocyanate content should be about 5 per cent.

The authors of the present paper have generally confirmed the findings of Kokorin and Dermanova. Beer's law is obeyed with bismuth concentrations up to 8 mg. per litre (10 μg. per sq. cm.), the sensitivity is 13×10^{-2} μg. per sq. cm., and the relative error does not exceed 1 per cent within the range 8 to 25 μg. per sq. cm. The colour is stable for 1.5 hours.

The use of stannous chloride for reducing ferric iron is inadvisable: a cloudiness may appear, due to hydrolysis, and chloride ions should be avoided if possible. It is recommended that titanous sulphate be used instead of stannous chloride.

By the addition of a 2 per cent solution of titanous sulphate a colour intensity is produced somewhat greater than when stannous chloride is used. Beer's law holds good over the range indicated. The sensitivity is 11×10^{-2} μg. per sq. cm. The colour intensity remains unchanged for 2 hours in the presence of small concentrations of bismuth, and for 1.5 hours with 0.15 mg. in 15 ml.

For comparison of the characteristics of the three methods some of the relevant data are given in the Table. For small amounts of bismuth the iodide method is preferable, unless lead also is present.

ELECTROSTATIC PRECIPITATION

Belgium Adopts Large U.K. Equipment

IN an effort to overcome a nuisance from noxious gases produced at the Vieille Montagne Chemical Works (Belgium), a high voltage precipitation plant, believed to be the largest of its type in existence, has recently been installed. The automatic gear associated with the apparatus embodies a series of safety devices which are claimed to make it unique in its present application.

Gases which were being produced at the Vieille Montagne works were found to contain potential by-products, which, when passed to the atmosphere from a chimney, were rich in arsenic and SO_2 plus water vapour, forming H_2SO_3. They were having a very detrimental effect on the surrounding agricultural land over an area of 90 sq. miles.

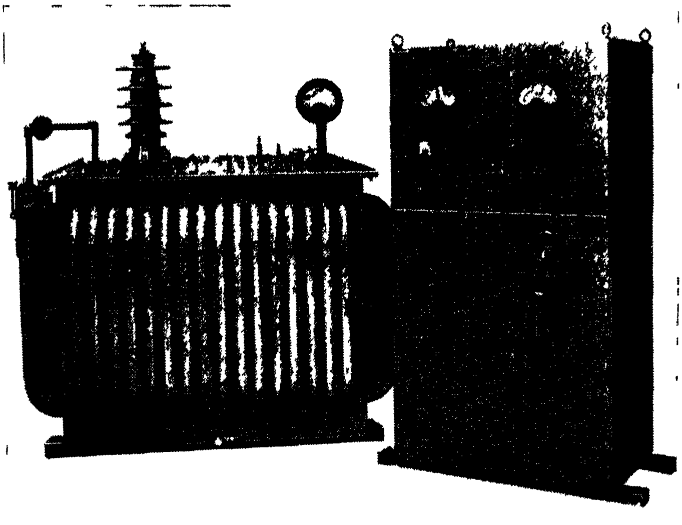
For the purpose of cleaning the gas, three lead-lined precipitator chambers were installed, each chamber having a separate gas feed from a common output. When the precipitator—made and installed by Partridge, Wilson & Co., Ltd., Leicester—was put into operation, the gases were cleaned in under one minute and the poisonous fumes from the chimney stack were, it is stated, completely eradicated. The injurious compounds were electrostatically precipitated and drained.

The Davenset rectifier installed has a rated output of 50,000 volts d.c. at 200 milliamps. When no load was imposed, the voltage rose to 96,000 volts, on the maximum output setting. When the three precipitator tanks were in operation, a current of 100 milliamps. at 37,000 volts was found to be sufficient to give excellent results. The remaining capacity will be absorbed, in all probability, with the later installation of three additional precipitator chambers.

To control the installation, an instrument panel is provided, and, since it is common to have temporary short circuits due to the nature of the process, special precautions are taken.

Major fault protection is given by fuses first protected by magnetic overload devices. Temporary fault conditions are dealt with by a 3-shot arrangement. When a fault occurs, probably as a result of temporarily overloading, the supply is interrupted and reinstated after an interval of three seconds.

If the overload or short circuit is not cleared naturally after the first, second or third automatic reinstatement of the power, then an electric lock-out occurs and a warning siren and light signals operate.



The oil-immersed rectifier of the precipitation unit is of the selenium type, employing a voltage doubler circuit. The transformer and protective mechanism are mounted in the main precipitator tank

The Chemist's Bookshelf

HOT-TINNING. W. E. Hoare. Tin Research Institute. Pp. 112, with 47 illustrations.

Compiled primarily to meet the needs of operative tinners, foremen and design engineers this practical manual gives complete working instructions for the production of hot-tinned coatings on fabricated articles. Considerable attention is devoted to plant requirements, general services and safety precautions, and useful suggestions are given for plant lay-out.

Procedures used for cleaning, pickling and fluxing ferrous and non-ferrous metals in preparation for the actual hot-dipping operation are dealt with, also the composition and preparation of the various cleaning, pickling and fluxing solutions.

The central theme is the dip-tinning operation in various forms, giving attention to new techniques developed by the Tin Research Institute laboratories for the tinning of steel and cast iron. There are also useful references to methods of minimising the contamination of tinning baths and disposal of residues. An appendix gives data and conversion factors and there is an adequate bibliography and numerous diagrams, flow sheets, and photographs of plant.

ATOMIC ENERGY YEAR BOOK. Edited by Dr. John Tutin. 1949. London: Temple Press, Ltd. Pp. xx + 237. 21s. net.

The usefulness of this book is not seriously impaired by its somewhat misleading title. It made the reviewer think as much about the rôle of year books as it did about atomic energy. It contains a large amount of valuable review type of information on the history of nuclear science, a rather dramatic account of the starting of the first reactor and some lucid explanations of the mode of action. Economic consequence of atomic energy are also briefly dealt with, but the implications are rather narrowly interpreted. Thus, the main discussion is directly on comparison of costs of energy production by conventional means and from atomic energy, with estimates of the possible saving of coal in Britain. Other chapters review atomic energy developments in various countries and indicate the legal aspects as they apply within Britain. In view of the increasing application of radio-isotopes in industrial laboratories, the survey on design of radiation laboratories and the organisation of safety technique is contemporarily important. Appendices and tables of elements and isotopes and of national scientific academies complete the volume.

It is understandable that the first book of this kind should include a large amount of general review material. But there is perhaps too little recognition of the main function of a year book—to review progress during the preceding year. The omission from the title of the year of issue is unfortunate, since tables are included of the composition of various committees which are likely to change from year to year.

Another important gap is that there appears to be no indication of *industrial* uses as against those in medical research. It is true that industrial uses have in fact been small, but they have been sufficient to justify notice. Notwithstanding all such reservations and criticisms, the Atomic Energy Year Book will fill a useful place which has been conspicuously bare.—B.

Welsh Lead Prospects

POSSIBILITIES of a revival of lead mining in a small section of the Snowdonia National Forest Park centred on Bettws-y-Coed appear to have been confirmed by the work of a team of 16 engineers and geologists, engaged on a survey of the area. It is about four sq. miles in extent with dumps marking the location of 15 old mineworkings. Engineers consider that these mines were only "scratched," and believe the area retains substantial lodes which would yield lead and zinc. The abandoned mines have been thoroughly examined and engineers will now use diamond drills to bring up sections of underground strata for inspection. It is hoped to start these operations before the end of the month.

◆ HOME ◆

Oil and Colour Chemists' Association

The annual dinner and dance of the Manchester Section of the OCCA will be held at the Grand Hotel, Manchester, on Friday, October 28.

Acetyl-Acetone Exempted from K.I. Duty

A new Treasury order exempts acetylacetone from Key Industry Duty for the period beginning October 6, and ending December 31, 1949. The decision is given effect by The Safeguarding of Industries (Exemption) (No. 7) Order, 1949, SI 1829.

Lead and Zinc Prices Fall

The Ministry of Supply price of good ordinary brand zinc was reduced as from October 8 by £6 per ton—to £81 10s. per ton delivered. The rates for other grades are correspondingly lowered. The price of good soft pig lead was reduced, as from October 12, by £4 per ton—to £111 a ton delivered.

Liverpool's Smoke Problem

Local stokers attended the School of Hygiene, Mount Pleasant, Liverpool, on October 7 to see two sound films demonstrating the application of science to their work. While smoke abatement officials are doing much to prevent the careless production of smoke in industry, the greatest problem in Liverpool is the smoke from 190,000 house chimneys.

Coal Output

Britain's output of deep-mined coal last week, although slightly higher than the previous week and the corresponding week of 1948, was not sufficient to reach any of the targets for 1949. Comparative figures are:—Last week; Total 4,341,300 tons (deep-mined 4,070,700 tons, opencast 270,600 tons). Corresponding week last year: 4,167,500 tons (deep-mined 3,931,000 tons, opencast 236,500 tons).

Administration of Radiochemical Centre

Notice has been given by Thorium, Ltd., which has acted as managing agents of the radiochemical centre, Amersham, since November, 1946, that it is terminating its contract as from March 31, 1950. Announcing this change, the Ministry of Supply states that the work of the centre consists of the processing, packing and distribution of both natural and artificial radioactive substances. The work on artificial substances was now assuming an unforeseen importance, and the firm felt that running the centre was requiring an undue proportion of its managerial attention.

Shell's Manchester Office

Shell Chemicals, Ltd., has moved its divisional office to 42 Deansgate, Manchester 3 (Telephone: Deansgate 6451), where the headquarters of the Northern division is now located.

Soya Bean Experiments

Experiments in the cultivation of soya beans in the hope that they could be made available in Ireland for the making of plastics are being carried out in Dublin Botanic Gardens. It is hoped to create a new variety which will ripen under normal Irish summer conditions.

Spanish Firm Seeks Collaboration

A chemical undertaking with large productive capacity in Spain has approached THE CHEMICAL AGE for help in contacting U.K. chemical interests which would collaborate in production in Spain, either by making patent processes available or in a closer association. This journal will transmit any inquiries to the Spanish company.

Oxides Production

Responsibility for national administrative arrangements for the production of antimony oxide, zinc oxide and lead oxides and compounds has been transferred from the Ministry of Supply (Metals Division) to the Board of Trade (Raw Materials Department). Applications for licences to acquire lead and zinc should still be addressed to the Director of Non-Ferrous Metals, Ministry of Supply, 20 Albert Street, Rugby.

Cement Makers to Safeguard Foreign Assets

Nine production groups in the British cement industry are proposing to form independent companies to safeguard their foreign interests from threatened nationalisation. Announcing this in London this week, the chairman of the Cement Makers' Federation, Lord Selborne, said it was the responsibility of all directors to safeguard their shareholders' property, and if they thought that it would be safer under a foreign flag they were certainly justified in forming a separate company to cut off the assets that could be seized by a Government in this country. He estimated the cement companies' foreign assets at less than a quarter of the whole—in Egypt, Mexico, America, Canada, India, South Africa, and Australia.

Next Week's Events

SATURDAY, OCTOBER 15

Institute of Physics

Birmingham: University, 10 a.m. (Midland Branch). Dr. G. V. Raynor: "The Experimental Approach to the Thermodynamics of Alloys."

MONDAY, OCTOBER 17

The Royal Institute of Chemistry

Dartford: County Technical College, Essex Road, 7.30 p.m. (London and South-Eastern Counties Section, joint meeting with SCI). Dr. H. Barron: "Plastics and Corrosion."

The Chemical Society

Oxford: Physical Chemistry Laboratory, 8.15 p.m. Alembic Club Lecture. H. M. Powell "Compounds of the Inert Gases."

TUESDAY, OCTOBER 18

Society of Chemical Industry

London: Royal College of Science, Imperial Institute Road, South Kensington, S.W.7, 2.30 p.m. (Agricutural Group, joint meeting with the Society of Public Analysts and Other Analytical Chemists and the Fertiliser Society). Subject: "Fertiliser Analysis, with special reference to Available Phosphoric Acid."

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. J. Blears (Metropolitan Vickers): "Mass Spectrometry."

Institute of Physics

London: 47, Belgrave Square, S.W.1, 5.30 p.m. (Electronics Group). A. W. Willoughby (GEC): "Some Recent Developments in Mercury Vapour Lamps and their Associated Equipment."

WEDNESDAY, OCTOBER 19

The Royal Institute of Chemistry

London: Wellcome Research Institution, 183, Euston Road, N.W.1. The chairman (J. G. A. Griffiths), introductory talk: "Rockets and Chemistry," followed by film "Rocket Flight."

Society of Chemical Industry

Belfast: Queen's University, 7.30 p.m. (Food Group, joint meeting with Northern Ireland Section). Prof. R. G. Baskett: "Agricultural Chemistry in Northern Ireland."

British Ceramic Society

London: Royal Sanitary Institute, 90, Buckingham Palace Road, S.W.1. Annual meeting of the Refractory Materials Section. (Two days).

THURSDAY, OCTOBER 20

The Chemical Society

London: Imperial College of Science and Technology, South Kensington, S.W.7, 7.15 p.m. Tilden Lecture. Prof. E. R. H. Jones: "Acetylene and Acetylenic Compounds in Organic Synthesis"

Hull: University College, 6 p.m. (Joint meeting with University College of Hull Scientific Society). Prof. A. R. Todd: "The Mechanism of Drug Action."

Nottingham: University, 6.30 p.m. (Joint meeting with Nottingham University Chemical Society). Dr. E. J. Bowen: "The Scattering of Light by Solutions."

FRIDAY, OCTOBER 21

Royal Institute of Chemistry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 5.30 p.m. Special general meeting. F. Roffey: "The Development of Chemical Processes."

The Chemical Society

Birmingham: University, 4.30 p.m. (Joint meeting with Birmingham University Chemical Society). Prof. C. E. H. Bawn: "The Oxidation of Aldehydes in Solution."

Southampton: University College, physics department, 7.45 p.m. (Joint meeting with the Mid-Southern Counties Section, RIC, and the Chemical Society of Southampton Unversity College). Dr. Edson: "Medical Aspects of Radiation Chemistry."

Oil and Colour Chemists' Association

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. (Midlands Section). S. A. Polaine: "The Chemistry and Applications of Sulphonamide Resins."

Institute of Physics

London: 47, Belgrave Square, S.W.1, 4 p.m. (Industrial Spectroscopy Group). Annual general meeting. Dr. F. G. Tryhorn: "Physical Methods in the Forensic Laboratory."

Manchester: University, 4 p.m. (Manchester and District Branch, joint meeting with Low Temperature Group of the Physical Society). Prof. M. G. Evans: "Some Factors Influencing the Formation of Azeotropes" and other speakers; 7 p.m. Reports by British physicists on the "Conference on very Low Temperatures" held at the Massachusetts Institute of Technology under the auspices of the Union de Physik.

· PERSONAL ·

THE British Council has arranged for **Prof. C. K. Ingold**, professor of chemistry at University College (London), to visit Bologna at the invitation of the Sezione Emiliana of the Società di Chimica, to which he will lecture on "Band Spectroscopy of Benzene" and "New Ideas on Steric Hindrance." He leaves to-day (Saturday). A good deal of his time will also be spent on informal discussions at the University, and the Society is arranging for him to visit Ravenna and Florence. He was for some years the youngest Fellow of the Royal Society, having been elected when he was 30, and was awarded the society's Davy Medal in 1946.

Dr. P. D. Ritchie, head of the Department of Chemistry, Central Technical College, Birmingham, has been appointed to the Young Chair of Technical Chemistry at the Royal Technical College, Glasgow. Dr. Ritchie was head of the Scientific Department of the Courtauld's Institute, London University, and a former head of the Department of Chemistry at the College of Technology in Leeds. He has held a number of appointments in industry.

Three Liverpool chemists, each a Fellow of the Liverpool and North-Western section of the Royal Institute of Chemistry for more than 50 years, were honoured by the section at its opening meeting of the 1949 season on October 6. Services to the community and to science in particular were acknowledged by the presentation of illuminated certificates to: **Mr. Walter Collingwood Williams**, **Mr. William Roscoe Hardwick**, and **Mr. F. Robertson Dodd**.

Prof. E. N. da C. Andrade has accepted the invitation of the managers of the Royal Institution to become director in the Royal Institution, resident professor and director of the Davy Faraday Research Laboratory. Prof. Andrade will take up his appointment on January 1, 1950. He will succeed **Prof. E. K. Rideal**, whose resignation has been accepted with regret.

Mr. C. D. L. Smith has been appointed a director of Wilfrid Smith, Ltd., chemical manufacturers and merchants, London, E.C.3 The new director is the son of the chairman, Mr. Wilfrid Smith.

Mr. R. R. Sillifant, newly-elected president of the North London branch, Institute of Welding, being invested by the retiring president, Mr. S. P. Bennett, with the collar and badge which the latter had donated to the branch

The following officers and council were elected at the annual general meeting of the Irish Chemical Association: President, **Mr. D. Crowley**; vice-president, **Mr. W. V. Griffith**; hon. secretary, **Mr. G. F. O'Sullivan**; hon. treasurer, **Mr. M. J. Cranley**. Council: **Miss D. Hurley**, **Mr. V. C. Barry**, **Mr. J. G. Belton**, **Mr. T. G. Brady**, **Prof. W. Cocker**, **Prof. T. Dillon**, **Mr. F. T. Riley**, **Prof. T. S. Wheeler**.

Mr. A. T. Robertson, chief planner of the Fort Dunlop group of factories and factory manager of St. Mary's Mills, Leicester, has been appointed works director of Dunlop, South Africa, Ltd., in succession to **Mr. E. E. Quinton**, the new general works manager of the Speke factory.

Mrs. E. Heathcote has been appointed a director of Spencer, Chapman & Messel, Ltd. Mrs. Heathcote has been connected with the firm for the past 15 years, and as secretary (as Miss E. Saunders) for six years.

During the annual golf competitions, held in connnection with the half-yearly general meeting of the Association of British Pharmaceutical Industry at Scarborough, last week, the Bowman cup was won for the third year in succession by **Mr. N. M. Holmes** (Richard Daniel & Son, Ltd.); the Morson Trophy by **Mr.**

E. D. Nadin (William Ransom & Son, Ltd.); and the Victorian Trophy by Mr. R. K. Allen (Stafford Allen & Sons, Ltd.), who followed up this success by holing out in one at the fifth during a private match the same afternoon.

Professor Eric Ashby has been appointed president and vice-chancellor of the Queen's University of Belfast. He has been George Harrison professor of botany at Manchester University since 1946, and was for some years in Australia, where he was chairman of the national research council 1940-42, a member of the Power Alcohol Committee of Inquiry, 1940-41, and conducted an inquiry for the Prime Minister into the enlistment of scientific resources in war. In order to complete work in Manchester, the professor will not take up his new appointment until September next year.

On Monday next, Mr. N. A. W. Le Grand takes up his appointment as secretary of the British Welding Research Association, filling the vacancy created by the resignation of Mr. A. Barker, who has joined the staff of the British Boot and Shoe Manufacturers' Association.

Mr. K. R. Hopkirk, chief mechanical engineer, has been elected a director of the British Thomson-Houston Co., Ltd.

OBITUARY

THE death was announced this week of Dr. Arthur Pillans Laurie, principal of the Heriot-Watt College, Edinburgh, from 1900 until 1928, and professor of chemistry to the Royal Academy of Arts since 1912. The doctor, who was born in 1861, was educated in Edinburgh and Cambridge. In 1895 he became lecturer in physics and chemistry at St. Mary's Hospital Medical School, and three years later examiner in oils and colours to the City and Guilds Institute. During the 1914-18 war Dr. Laurie was a member of the Chemical Products Supply Committee, Board of Trade, and chairman of the Chemical Inventions Committee, Munitions Inventions Department, Ministry of Munitions, and of the Chemical Waste Products and Building Materials Committee. He was an expert in paints, pigments, and processes, and published a number of works on the painter's craft and materials

Indian Science Congress

Many scientists of international repute are to attend the 37th session of the Indian Science Congress, to be held in Poona from January 2 to 8, 1950. Prof. Mahalanobis will be President.

CHEMICAL PLANT GROUP

Effective Combined Operations

THE development of widening responsibility for various phases of chemical engineering and associated constructional work was signalised by a cocktail party in London last week at which clients and associates of D. & C. and William Press, Ltd., celebrated the completion of one of its largest undertakings, the erection in association with E. B. Badger and Sons (Gt. Britain), Ltd., of a 40,000-barrel crude oil toppng unit at Llandarcy, South Wales.

The creation of D. & C. and William Press, Ltd., represents an interesting pooling of interests by two companies, the Demolition and Construction Co., Ltd., and William Press & Son, Ltd., in recognition of the complementary nature of the work in which each is a specialist, both required in current large projects for increasing capacity of oil refining and chemical processing. Wide experience in chemical engineering procedure was gained during the war by William Press & Son in seven large ordnance factories, of which the work performed at Bishopton, Scotland, involved a contract of £750,000. Somewhat similar work is now being carried out at the Atomic Energy Research Establishment, Harwell.

Disillusionment

SINCE the war we have gone to extremes in control, just as many years ago some people thought we went to extremes in freedom. After five years of a completely planned life, everything goes steadily down in quantity and quality and persistently up in price; tendencies which, as might be expected, are the exact reverse of the trends under freedom.

At last the danger is tragically apparent. The small number of those who are working on their own responsibility is rapidly diminishing and the much larger number of those who do no work, except to tell others what to do, or not to do, still increases. Every day that this abuse is allowed to continue makes our chances of recovery still more slender.

As each morning produces a new crisis, the truth is penetrating to the dullest brains. The disillusionment will be a painful process. Nothing can avert that necessity. But it will surely cause us frankly to disown the sloppy sentimental immorality of the political tendencies started by Sir William Harcourt and ended by Lord Beveridge.—Sir Ernest Benn.

◆ OVERSEAS ◆

Indian Mustard Oil

The Government of India has imposed an export duty of eight annas per lb. on mustard oil.

Superphosphate Manufacturers' Paris Office

The International Superphosphate Manufacturers removed the office of its Agricultural Committee to 1 avenue Franklin D. Roosevelt, Paris 8e (telephone: BAL 57-25).

Rising Asbestos Output

Italian statistics for the first seven months of the current year disclose an output of 180 tons of long fibre asbestos and 7800 tons of short fibre. If this pace is kept up, the year may be expected to close with a total of over 13,500 tons of asbestos, *i.e.*, the highest figure ever reached in Italy.

Plastics from Milk

Galalith, a lastic manufactured from casein, as a by-product of brown whey cheese, has been in considerable demand from Norway for some time. A firm has now been established in Norway itself to manufacture a variety of galalith products (plates, rods, tubes, etc.), and it is hoped to begin exporting next year when the home demand has been met.

Anti-Fouling Composition

A new anti-fouling composition for ship's bottoms and a special method of application, under pressure and at a temperature of about 100° C., have recently been developed by a Swedish engineer, Hr. Sten Jeurling, of Stockholm. The principle is being tested on M.S. *Hjalmaron*, of the Transatlantic Co., which left recently for tropical waters where molluscs and marine flora always cause heavy fouling and reduced speed.

Expanding French Potash Sources

The *Sté des Mines de Potasse et de Magnesie du Boudigot* is pursuing research with the object of enabling 3000 tons of potash to be extracted monthly. Work is proceeding at two different levels: at 400 and 650 metres. At 400 metres considerable tonnage has been observed but content is poor and this zone will be fully exploited only when concentration methods now being studied are completed. At 650 metres several seams of 1 metre to 1.3 metre have been cut, containing between 15 and 20 per cent pure potash.

Pottery Experts for India

Six Japanese pottery experts are to spend two years in India to introduce Japanese techniques in the Indian ceramic industry.

Sharing Atomic Knowledge

The first stage of the exploratory talks on atomic energy between the U.S.A., Britain and Canada have now been completed. A wide range was covered, looking towards a partnership of the three powers based on joint utilisation of materials, techniques and knowledge available.

French Oil Equipment for Mexico

Under the terms of a recent barter agreement between France and Mexico, covering trade valued at U.S. $10 millions, Mexico is to receive oil drilling equipment as well as machinery for oil refineries. In return, she is to supply France with iron ore, silver, copper, linseed, tobacco, coffee and cotton.

Ceylon Citronella Oil

A big demand for Ceylon citronella oil from London and New York markets is reported, which local producers find it difficult to fill. Prices have risen from Rs.2.10 to Rs.3 a lb. The previous average monthly production of citronella oil in Ceylon of about 70 tons has now decreased to 30 tons. During the war citronella oil fetched Rs.6 a lb.

New Tin Allocations

The continuance of the international allocation arrangements for tin is confirmed by the Ministry of Supply announcement that the Combined Tin Committee has made the following interim allocations of tin metal (in long tons) for the second half of 1949:—Austria 200, Ceylon 25, Chile 100, Israel 90, Japan 1400, Korea 20, Pakistan 200, Sweden 250; total 2285.

Decline of Italian Mining Output

Statistics for the first half of the current year show that a number of Italian mineral products suffered falls in output, as compared with the first half of 1948. Some characteristic results were: Bauxite from 92,900 to 57,400 tons; antimony 2200 to 1600; arsenic 2100 to 1300; barytes 27,600 to 21,100; anthracite 45,500 to 38,800; Triassic coal 13,400 to 7500. There were, however, some increases, notably of iron ore, ferro-manganese ore, zinc, asbestos, natural gases, and combustible bituminous shale.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Ceramic Tiles & Products. Ltd., Stoke-on-Trent. (M. 15/10/49.) September 7, mortgage, to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; charged on dwelling house, 16 York Street, Hanley, and fixtures etc. *£700. October 14, 1948.

Chemring, Ltd., London, W.C., dealers in chemical products, etc. (M., 15/10/49.) September 12, mortgage to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; charged on certain contract moneys. *Nil. February 17, 1948.

Dawe Instruments, Ltd., Brentford. manufacturers of engineering, scientific etc. instruments. (M., 15/10/49.) September 6, £10,000 debenture, to Branch Nominees, Ltd.; general charge. *Nil. May 31, 1946.

Livingston Refractories, Ltd., London, E.C. (M., 15/10/49.) September 7, £29,500 debenture, to H.M. Treasury Solicitor; charged on lands, mines, minerals, etc., as specified in rider to debenture and a general charge. *£9,750. January 14, 1949.

Petroleum Inventions, Ltd. (formerly Petroleum Inventions & Specialities, Ltd.), London, W. (M., 15/10/49.) September 2, collateral debenture securing to District Bank, Ltd., all moneys due or to become due to the Bank from Manchester Oil Refinery, Ltd., secured by a mortgage and debenture dated April 4, 1949; charged on the stocks of and book debts for the time being due to company and all securities whether direct or collateral for such book debts. *Nil. July 14, 1948.

Welsh Ceramic Industries, Ltd., Cardiff. (M., 15/10/49.) August 31, charge, to Burnley Building Society securing £1600 and any other moneys, etc.; charged on land with dwelling house known as Brynheulog, Caerau, Cardiff.

Satisfactions

Fisons, Ltd. (formerly Fison, Packard & Prentice, Ltd. & Edward Packard & Co., Ltd.), Ipswich, fertiliser manufacturers. (M.S., 15/10/49.) Satisfaction September 21, of series of debentures registered July 5, 1934.

Charles Newton (Chemical Works), Ltd., London, N. (M.S., 15/10/49.) Satisfaction September 12, £500 registered August 11, 1938.

Trent Oil Products, Ltd., London, W. (M.S., 15/10/49.) Satisfaction September 12, of debenture registered April 7, 1931.

Trent Oil Products (Sales), Ltd., London, W. (M.S., 15/10/49.) Satisfaction September 12, of debenture registered November 27, 1931.

Company News

Fisons, Ltd.

Acceptances by holders of ordinary shares absorbed 97 per cent of the 2,219,278 £1 ordinary shares offered by Fisons, Ltd. The issue was oversubscribed.

Increase of Capital

The following increases in capital have been announced: Murex, Ltd., from £1,650,000 to £2,650,000.

New Registrations

Randol Enterprises (London), Ltd.

Private company. (473,403). Capital £100. Manufacturers of liquid soaps, detergents, disinfectants and rust-removing preparations, etc. Directors: C. Niman, K. L. Salzedo, R. Randolph. Reg. office: Royal London House, 17, Finsbury Square, E.C.2.

East London Chemical Warehouse Co., Ltd.

Private company. (473,371). Capital £100. Warehousemen of oils, soaps, fertilisers, etc. Director: J. Levy. Reg. office: 5-6 Clements Inn, W.C.2.

Frederick C. Kane, Ltd.

Private company. (473,596). Capital £1500. Objects: To design, supply, instal, service and maintain plant and machinery for general uses in brewery, chemical and kindred industries, etc. Directors: F. C. Kane, L. M. Kane, G. H. Kemp, J. W. Stephens. Solicitors: W. White & Co., W.2. Reg. office: 7 Sunbeam Road, Park Royal, N.W.10.

The Stock and Chemical Markets

STOCK markets have remained more active and prices in most sections have moved sharply. Gold shares, although still the most active department, were subject to profit taking, and falls of over £1 have been recorded in British Funds, which were affected by the suggestion that an increase in the Bank rate may be inevitable next year.

Reflecting the better trend in leading industrials, Imperial Chemical had rallied sharply to 44s. 1½d. at the time of writing, and the 7 per cent preference shares were better at 29s. 3d. following the denial of market rumours that the company was contemplating a big debenture issue.

Monsanto Chemical 5s. shares have been firm at 51s. 3d., Fisons strengthened to 29s. 6d., and Laporte Chemicals 5s. units were 10s.; Burt Boulton were marked 25s.

In other directions, Albright & Wilson were around 30s., and Brotherton 20s., F. W. Berk 2s. 6d. shares 12s. 6d., Amber Chemical 2s. shares 5s. 3d., and Boake Roberts 29s. Bowman Chemical 4s. shares were 6s. 9d., and Glaxo Laboratories remained active on the share bonus, but at £19¼ were lower than a week ago.

Turner & Newall have been firm at 78s. 1½d., and United Molasses higher at 41s. 3d., and the 4s. units of the Distillers Co. 27s. 6d., but Lever & Unilever eased to 43s. 6d.

Elsewhere, British Glues & Chemicals eased to 19s., but Borax Consolidated have remained firm at 57s. 6d., British Aluminium were 42s. 6d., British Oxygen 93s. 9d., and Dunlop Rubber moved up to 64s. Among preference shares, W. J. Bush 5 per cents were 23s., L. B. Holliday 4½ per cents 20s. 3d., and British Chemicals & Biologicals 4 per cents 18s. 9d.

Iron and steels participated in the better trend in industrials, with Stewarts & Lloyds at 53s. 6d., Guest Keen 40s. 3d., and elsewhere, Babcock & Wilcox further rallied to 63s. Colvilles moved up to 33s. in anticipation of the interim dividend, and United Steel firmed up to 26s. 7½d. awaiting the financial results. Tube Investments, however, moved slightly lower at £5 9/16.

Shares connected with plastics have been firmer: British Xylonite 75s., De La Rue 23s. 3d., and British Industrial Plastics 2s. shares 4s. 9d. Erinoid 5s. ordinary, however, were lower at 6s. 3d. on the reduced dividend. Lansil improved to 21s. 9d. on the new preference issue and confirmation that the Distillers Co. and British Xylonite are to increase their financial interests in the company.

Boots Drug strengthened to 50s. 6d., Courtaulds moved up to 34s. 9d. with leading industrials; Beechams deferred, were slightly lower at 13s. 10½d., Sangers 24s. 6d., and British Drug 5s. shares changed hands around 6s. 9d., Oils rallied, helped by the prospect of an increase in petrol prices. Shell were up to 70s., and Anglo-Iranian £7 5/16, although Trinidad Leaseholds eased to 26s. 9d.

Market Reports

A STEADY demand has again been reported for industrial chemicals, with aggregate movement to the consuming industries remaining very substantial. Inquiries for overseas destinations have been fairly plentiful and the actual volume of bookings by traders has been satisfactory. There has been a steady call for supplies for the general run of soda products, with quotations unchanged, and a steady pressure for deliveries for most of the potash chemicals is inevitable. Barium chloride, hydrogen peroxide and formaldehyde are items in active request while the call for the white and red leads appears to be unaffected by the recent price changes. Nothing of outstanding interest falls to be reported in the coal tar products market and conditions and prices remain unaltered.

MANCHESTER.—Fairly active trading conditions have been reported on the Manchester chemical market during the past week. Delivery specifications for the soda compounds, as well as for most other descriptions of heavy chemicals, have been coming steadily from the principal home users and a fair amount of replacement buying has been reported. The volume of export business seems to have been maintained. Some varieties of fertilisers are being taken up in satisfactory quantities for the time of the year. Relatively quiet conditions continue in many sections of the tar products market.

GLASGOW.—There has been a falling off in inquiries for prices of chemicals in the earlier part of last week, but latterly renewed activity has been recorded, and there has been a perceptible addition to the general volume of business. There is a definite tendency towards price increases.

Continued Rise of Swiss Chemicals

Headway Maintained Despite Heightened Difficulties

IN recent years, and especially under the stimulus arising out of the conditions of the second world war, the Swiss chemical industry has developed rapidly and extensively. This growth is not to be attributed solely to war conditions or to the elimination of competition from Germany. Much of it is due to the enterprise and energy of the Swiss chemical firms, to intensification of research, and to the qualities of the chemists and others.

The numbers of factories and of persons employed in 1938 and 1948 provide a significant contrast: 1938, 276 factories 1948, 378; 1938, employees, 12,763; 1948, 26,031. The number of chemical factories is not actually a very definite factor, for in Switzerland, as elsewhere, there has been a marked tendency to coalesce and organise on a large scale; also to concentrate in certain localities, as in Basle, for example. The fact, however, that the number of people employed has more than doubled is truly significant.

Interest in Science

In recent years, scientific and technical instruction has figured more prominently than ever in the Swiss universities, colleges, and technical schools; and the Swiss people, always highly educated, have responded zealously to the increased facilities for technical training.

The relative smallness of the Swiss home market has naturally stimulated interest in exports, and export trade generally is efficiently organised. It is not left solely to salesmen, however well trained; heads of firms rank highly among their principal duties the need to visit other countries and build up trade connections.

In 1948 the Sandoz A.G., of Basle, exported about 90 per cent of its entire output. With a total value of about S.Fr.600 million, the chemical industries contribute a fifth of the total exports. The overall figures for 1948 (in million Swiss francs) are of interest.

Exports of coal tar dyes were 260, pharmaceuticals 170, and oils and fats and products thereof 90-100. Among the chief export markets for dyes in 1948 were: France 31.48, Czechoslovakia 20.65, Brazil 60.2, Holland 18.28, Italy 17.0, Great Britain 11.2, U.S.A. 11.7, India 13.4, Belgium 10.4. Some of the principal buyers of pharmaceuticals were: Argentina 14.2, Brazil 11.1, Italy 14.17, U.S.A. 9.5, France 7.7, Holland 4.3, Spain 4.8, Portugal 5.3, Czechoslovakia 6.5, and Great Britain 1.9.

It is, however, not anticipated that it will be easy to maintain high levels of export, in view of the increasing competition of the U.S.A., and the possible early revival of Germany's chemical export trade. British chemical exports, too, are keen rivals in many world markets. Non-active particpation in the Marshall Plan also has tended to operate unfavourably in some respects.

It is emphasised that, owing to U.S. exports of drugs, etc., and increasing competition in this field, especially in the European markets, Swiss purchases of raw material in Europe have been seriously restricted, owing to high prices payable, presumably by American firms. This has accounted for increased trade to non-European countries, in the so-called "compensation" trading.

In the Swiss drug export trade there has been a considerable amount of financing by way of export premiums. This must necessarily be only a temporary expedient; and during this year, 1949, it was hoped that freer trading would be possible, less hampered by restrictions.

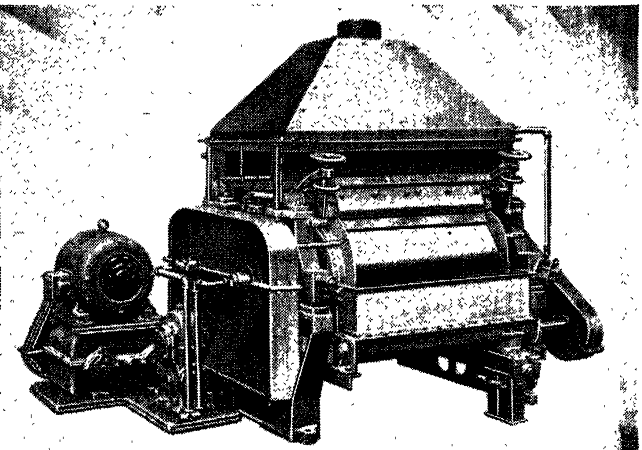
While dyes and drugs continue the two principal branches of Swiss chemical industry, other lines are by no means inconsiderable. That can certainly be said of insecticides and DDT—strictly a branch of the drug industry—coming principally from Geigy A.G., of Basle. In these as also in synthetic tannins, etc., there has, however, been increasing competition and some decline in trade. That result, so far as tannins are concerned, has been associated with the growing use of rubber in place of leather.

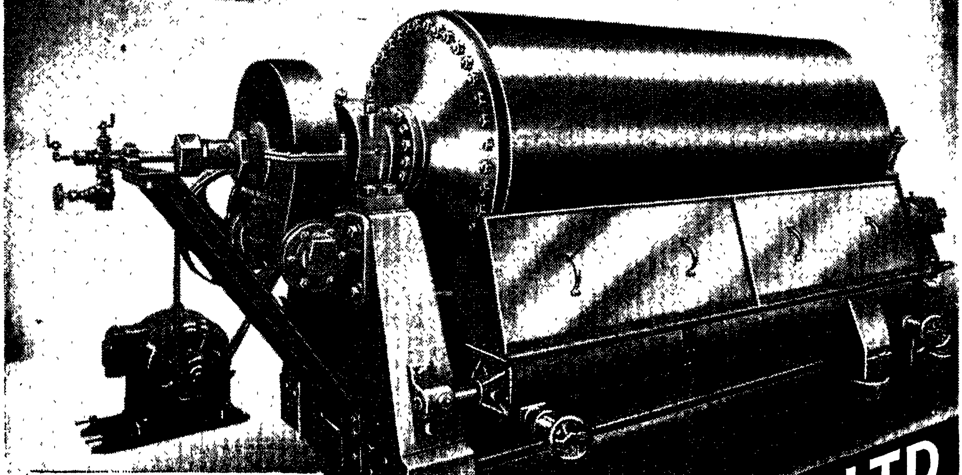
Currency Problems

Conditions in the synthetic resin and plastics field are not very promising. Imports of resins in 1948 were 2.5 million kg., compared with an export of only 1 million kg. The effects on Swiss chemical exports of new trends in international trading, exchange and currency manipulations, to which must now be added the recent devaluation of the £ sterling, are still very difficult to forecast.—(*Chem. Industries*, 1949, 3, 114-116).

Manlove's FILM DRYERS

For producing flakes and powders from liquids or slurries. Where previously a slurry has been filtered to form a cake and then dried on trays, the film dryer can often be used instead to produce continuously and automatically, a dried product *direct* from the slurry.





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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Manufacture of intermediates for the production of dyes, in the manufacture of polymethin dyes, and in photographic silver salt emulsions containing such dyes. —Kodak, Ltd., F. M. Hamer, R. J. Rathbone, and B. S. Winton. Feb. 22 1946. 629,106.

Synthetic resin products.—N.V. Philips' Gloeilampenfabrieken. May 29 1941. 629,161.

Moulding thermoplastic synthetic resins by extrusion.—S.P.A. Lavorazione Materie Plastiche. Feb. 2 1940. 629,109.

Screw extrusion presses.—S.P.A. Lavorazione Materie Plastiche. April 30 1943. 629,110.

Method of adhesively uniting materials, especially metals, and adhesives therefor. —Ciba, Ltd. July 13 1945. 629,111.

Process for manufacture of magnesium compounds.—Marine Magnesium Products Corporation. May 10 1943. 629,262.

Means for indicating and/or controlling the level of molten glass and other liquids. —Australian Glass Manufacturers Co., Proprietary, Ltd. Aug. 24 1945. 629,271.

Calcining of borax.—F. J. Hendel. Oct. 1 1946. 629,171.

Extensometers.—United States Steel Corporation of Delaware. June 28 1946. 629,277.

Therapeutic agents and processes of preparing the same.—Merck & Co., Inc. Oct. 19 1945. 629,281.

Apparatus for and method of treating granular material.—H. S. Simpson. May 2 1946. 629,172.

Method of and apparatus for recovering granular material such as sand.—H. S. Simpson. May 2 1946. 629,173.

Method of manufacturing substituted quinolines.—C. C. Price, and R. M. Roberts. March 1 1946. 629,282.

Method of and apparatus for making a multiple layer unit of powdered material suitable for use in the manufacture of friction discs.—A. F. Burgess (S. K. Wellman Co.). Nov. 5 1946. 629,291.

Manufacture of hydrazine compounds and derivatives thereof.—Ciba, Ltd. Dec. 21 1945. 629,177.

Apparatus for the determination of the moisture content of particulate or granular substances.—R. C. Noyes. (L. M. Telefonaktiebolaget.). Feb. 7 1947 629,183.

Machines for treating fabrics with liquids, applicable also to analogous machines.—Seller & Co. (Huddersfield), Ltd., and E. R. Sellers. Feb. 12 1947. 629,310.

Catalysts and catalytic processes.—Soc. Normande de Produits Chimiques. Feb. 15 1946. 629,312.

Manufacture of chlorine.—Manufactures de Produits Chimiques du Nord Etablissements Kuhlmann. Dec. 24 1946. 629,313.

Process for the production of alkali metal alkoxides.—I.C.I., Ltd., and R. A. Rosser. Feb. 26 1947. 629,184.

Bimetallic elements.—Mond Nickel Co., Ltd. March 15 1946. 629,117.

Manufacture of hydrophenanthrene monocarboxylic acids and derivatives thereof.—Ciba, Ltd. March 7 1946. 629,118.

Apparatus for the decomposition of alkali metal amalgams.—I.C.I., Ltd. March 8 1946. 629,315.

Processes for producing resinous material and the resinous material resulting therefrom.—Monsanto Chemical Co. March 20 1946. 629,320.

Manufacture of intermediates for the production of dyes, the manufacture of polymethin dyes and photographic silver salt emulsions containing such dyes.—Kodak, Ltd., F. H. Hamer, R. J. Rathbone, and B. S. Winton. Feb. 22 1946. 629,122.

Manufacture of intermediates for the production of dyes, the manufacture of polymethin dyes and photographic silver salt emulsions containing such dyes.—Kodak, Ltd., F. M. Hamer, R. J. Rathbone, and B. S. Winton. Feb. 22 1946. 629,123.

Method of producing infiltrated ferrous bodies of complicated shape.—American Electro Metal Corporation. April 23 1946. 629,326.

Stabilised synthetic polymers.—British Thomson-Houston Co., Ltd. May 13 1946. 629,332.

Production of titanium dioxide.—New Jersey Zinc Co. July 12 1946. 629,333.

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The
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Belated Help for the Universities

RECENTLY, the vice-chancellor of Oxford University commented on the salaries of University lecturers and demonstrators. "It might well be," he said, "that scholarship could be pursued and imported with less dignity and ease than used to be considered desirable, but something approaching indignity and acute anxiety had been the lot of the young married don without private means who had been trying to keep up with his subject, buy his books, travel a little to refresh his mind and meet his colleagues, to take part in the social life of his group, keep and educate his family, and pay his fantastic rent in the Oxford of 1949 on, possibly, £700 a year."

With fresh recollections of the unstinted recognition which has lately been given to the importance of the part played by university workers, both in direct research and training those who will continue its course and apply it in industry, this reminder from one of the foremost centres sounds oddly incongruous. Yet the situation is, of course, not new, nor can many claim they did not know how meagre are the rewards of those who receive such generous treatment when credits are being given. If, from Oxford, one turns one's eyes to a wider field, including what are now generally known as the "redbrick universities," £700 is a generous salary figure. The common salary range has been something of the order of £500 to £800 for a lecturer, with assistant lecturers and demonstrators lying well below that level. Thus a lecturer at a salary of £700 has been capable of representing a source of mild envy to his colleagues.

It was immediately obvious that a critical situation for the universities was caused by the provisions of the Spens report, which affected seriously the position of all teachers on the medical side. However, a position almost precisely comparable in kind, if not in degree, had gradually developed in the science faculties throughout the country. New graduates were frequently going directly to posts which were appreciably better paid than those held by the men who had helped in their training, so high was the demand for research chemists and physicists.

The difficulty of staffing the science and medical faculties in our universities has therefore been increasing steadily, and the only answer to the problem lay in the step, taken by the Chancellor of the Exchequer last March, which made provision for a radical overhaul of university salaries

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

to bring them more nearly into line with the salaries offered outside for comparable seniority, responsibility and attainment. As the vice-chancellor commented, "It was true that the proposals had to be considered at a time when it was embarrassing even to talk about salary increases." What he wished to stress was that this step had been settled in principle nearly a year before that it was part of a concerted and carefully considered policy on the part of all universities in the country, and that it was a very belated step to catch up with what had been done earlier in other quarters.

It is unfortunately true that when the revision of salaries in the universities becomes widely known, adverse comment is likely to arise in less informed quarters. When the whole position is considered in its proper perspective it should, however, be fairly obvious that there is no rational basis for complaint. In the first place, an upward revision of university salaries has lagged far behind a similar move in practically all other fields, both professional and industrial, as a brief study of recent advertisements will make abundantly clear.

Secondly, it is on the maintenance of the highest possible quality in our university staffs that much of our progress in research and industry ultimately rests. What, however, has been the recent trend? It may be argued that perhaps more than in any other field, the university teacher enters into, and remains in, his post because he has a vocation for it. Consequently the disparity has to become marked before he will forsake his proper post for a more lucrative position in industry or some other sphere. But this stage has been reached, and more and more university teachers have been forced to ask themselves whether, if they were to be fair, for example, to their dependents, they could continue to ignore such a marked financial improvement for the sake of a job in which they felt themselves properly placed. Some, then, though by no means all, of the best men have been tempted from their proper field in university work to take up more lucrative work in industry and administration. Of those who remain, most have suffered from the inevitable worry and sense of inferiority which crippling underpayment and a steadily rising cost of living have encouraged; many have been forced to supplement their incomes by "spare time" activi-

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Notes and Comments

Professor Bernal

BECAUSE Prof. J. D. Bernal represents one of the more refractory problems in current affairs—one of those problems on which scientists and technologists seem incapable of throwing any light at all—we have reproduced elsewhere in this issue a condensed account of what the professor told an audience which assembled in London this week to hear his views on science in the Soviet Union. Prof. Bernal's inexplicable preference for the Soviet's ways, in some of the aspects which inspire in most free scientists here something akin to horror, is a phenomenon quite as arresting as, shall we say, helium's defiance of other natural laws when it is brought to extremely low temperatures. In the abnormal atmosphere of the Soviet science departments Prof. Bernal appears to shed many of the characteristics which one associates with any other scientist of his distinction or with any other Fellow of the Royal Society. Reading even the extract of his remarks which we have the space to reproduce, it would appear that Russian academies and cultural centres represent something very like a scientists' paradise, if objection is not taken to the fact that the State is prone to decide what are and what are not acceptable theories. The professor is evidently able to accept that state of affairs with equanimity, regardless of the complete freedom for scientists here, without which it is very possible his own distinguished contributions to crystallography would never have reached fruition.

Which?

IT is significant that, while he speaks of happily renewing acquaintance with former Russian colleagues, he has nothing to say of some others, no less distinguished, whose disappearance has been the subject of much unhappy conjecture among many here who knew them before their scientific views were branded as heretical, nominally by the Soviet Academy of Sciences or equivalent authority—under direction. No one will readily suspect Prof. Bernal of deliberately perverting the facts, yet he has again presented a picture of science in Soviet Russia which conflicts with nearly everything offered by other persons of equal integrity. Some of it—strangest of all—defies the axioms to which he has himself given allegiance in his newly published essays "Science and Liberty" and "Liberty and the Individual: the Scientist's View" ("The Freedom of Necessity"—Routledge and Kegan Paul, Ltd.).

Rubber Substitutes

TO be assured that synthetic rubber, the entity around which so many economic and other battles have raged, does not exist, is prone to administer a shock to some preconceived ideas. Mr. B. B. Evans's reminder to a group of the Royal Institute of Chemistry (page 563, this issue), if not news, conveys a fact which deserves more emphasis than it usually gets when the synthetic *versus* natural rubber controversy is exercised—that there is no product commercially available which is synthetic rubber, a true, man-made reproduction of the natural product. Most of the so-called synthetic rubbers are more correctly long chain polymers, usually amenable to manufacturing technique similar to that employed for natural rubber—usually, but not universally amenable. He made clear the significance of that when he was asked to account for the fact that use of the familiar GR-S (as an example) has failed to gain a hold here, regardless of the evidence in the literature of the good results obtainable, using the cold-mix process. First, GR-S is exclusively American and costs dollars. And, says Mr. Evans, GR-S can be considered only as a substitute for natural rubber, over which it has no advantages on technical grounds, and there are definite disadvantages in its use in the longitudinal processes. The extrusion process is widely employed in America, and that permits a greater use of GR-S. The fact should be remembered that the policy "GR-S instead of natural rubber" had in the past been largely dictated to the manufacturers by the U.S. Government. There would seem to be small prospect now that U.S. rubber-using industry will depart from the course into which it had been forced by circumstances, even in the name of Economic Co-operation.

A Fertile Scheme

THE undoubted success of the British steel founders' visit to the U.S.A. this year provides every good reason for confidence that the proposed trip by a fertilisers "productivity" team from this country will be comparably successful. Once again the Anglo-American Council on Productivity is to sponsor such a venture, the Fertiliser Manufacturers' Association collaborating with the Association of Chemical and Allied Employers to ensure that their representatives are equipped with the latest available information from the industry this side of the Atlantic. The supervisory, technical and workshops sections, four men representing each, form the complete team, members of which were entertained in London this week by the ACAE—presumably to discuss policy. It is encouraging to reflect that the British fertiliser industry, which has made such rapid progress during the past decade, is likely to have valuable experience—at least in the research field—to make available to the Americans. This team, representative of a most important part of our chemical industry, may have much to learn from such vast enterprises as the Tennessee Valley fertiliser production plant, which is using unorthodox but effective methods; it will, however, in some respects be less pupil than tutor. Substantial grants are to be provided by the Government, the FMA and the industry itself, and the project being a co-operative effort, the U.S.A. will take care of living expenses and travel over there. Fuller information will no doubt be made known when trade union officials and members of the fertiliser industry will meet the Press at a reception to be held on October 28 at the offices of the Anglo-American Council on Productivity. The team sails in the *Queen Elizabeth* next day.

BELATED HELP FOR THE UNIVERSITIES

(*continued from page* 548)

ties. Such compulsions, coming at a time when increasing numbers of students, shortage of space and equipment, and other conditions consequent on the war are making a very heavy additional demand, do not make for "the intellectual serenity and objectivity . . . the leisure to think at all," which are an essential for the fostering of scholarship.

The potential university teacher of the future, at the end of his student career, is far less likely to be persuaded to risk his future in a profession which is traditionally grossly notoriously underpaid. That tradition must be buried. Implementation of the expressed intention of the Chancellor of the Exchequer will undoubtedly go far towards removing all three of these restrictions on the well-being of a vitally important profession. Anyone familiar with the place of universities in the modern community, and with their recent history in our own country, will welcome a step which they must recognise as essential, beneficial and very overdue.

Textile Malt Industry

Malt for cotton processing is now being supplied to various Irish mills by the Irish firm, Mountmellick Products, Ltd. The production is under control of Mr. Helmut Donath, of Riga, Latvia, who has recently been appointed the company's malt brewer. Licences for the entry of textile malt from Ireland into the United Kingdom are now available under a recent trade agreement between the two countries

EXCHANGE RATE CHANGES

Effect on Import Licensing

AS a result of recent changes in certain rates of exchange, some import licences, expressed in terms of a sterling value, will not be sufficient to cover the full quantity of goods to which they were originally intended to relate, and arrangements have now been made to enable importers to meet their foreign currency commitments in respect of commercial contracts entered into on a foreign currency basis for the import of goods under valid import licences issued before October 5.

The effect of these arrangements is that authorised banks may approve applications for foreign currency to the full amount of currency contracts, so long as they are satisfied that the foreign currency applied for does not exceed the outstanding value of the relative import licence, converted at the rate of exchange ruling on September 17.

It has also been arranged that H.M. Customs and Excise will charge against import licences issued before October 5 the sterling equivalent of currency invoices, calculated at the rate of exchange ruling on September 17. [For duty purposes the current rate of exchange will, of course, apply]. Where consignments have been cleared by Customs since September 17, and the sterling value calculated at the new rate has been set against the import licence, the importer should approach H.M. Customs and Excise for an adjustment of the figures.

It should be emphasised that these special arrangements relate only to cases where the sterling cost of imports is increased because contracts have been placed in terms of foreign currency. The banks will not allow excess payments in the case of sterling contracts (even if there is an exchange variation clause) nor will H.M. Customs and Excise make any adjustments in the case of goods invoiced in sterling.

Lyons International Fair

The chemical industry will be well represented among the 5000 exhibitors at the Lyons International Fair which will be held next year from April 15-24. Among the newcomers will be R. H. Windsor, Ltd., manufacturers of plastic moulding machinery. An innovation (acknowledgment of which is made to the BIF), is the organisation of buyers' club for overseas visitors.

ELECTRONIC CONTROL

Industrial Interest in Scotland

SCOTTISH industrialists are reported to be showing increasing interest in specialised electronic equipment. The source of many such developments has been requests for a unit devised to perform a given function. From this a variety of alternative uses develop, giving a range of new appliances. Chemical companies have taken a prominent part in this process, as instanced by the electronic stop-watch unit shown at the Scottish Industries Exhibition.

This was designed originally by I.C.I., Ltd., to time the interval between the firing and explosion of a charge. It is now being adapted by a leading Glasgow firm to measure time intervals between any two phenomena. There have been many other examples of expanded use, following on a specific application.

An exhibition of standard equipment has lately been staged in the Engineering Centre, Ltd., Glasgow, by Atkins, Robertson & Whiteford, Ltd., showing Cinetel, Redifon, and Evans equipment. Another Glasgow company, Land, Speight & Co., Ltd., electronic engineers, also provided a demonstration, featuring standard equipment.

Obituary

THE death was announced this week at the age of 75 of SIR ROBERT PICKARD, F.R.S., vice-chancellor of London University from 1937-39, and for many years director of the British Cotton Industry Research Association. From 1899 to 1905 he was head of the chemical department of Blackburn Municipal Technical College, and from 1920-27 director of research of the British Leather Manufacturers' Research Association. He also served on the adhesives committee of the DSIR.

Sir Robert became director of research at the Shirley Institute in 1927. Under his guidance, the practical application of science to industry was particularly evidenced in his association with the Cotton Industry Research Association. He was vice-president of the Institute of Chemistry from 1927-30 and from 1939-43, and president from 1936-39.

PROF. BERNAL AND U.S.S.R.

Approval of Scientific Progress

BELIEF that the chemical industry of the U.S.S.R. is expanding so rapidly as to be capable in a few years of outstripping that of America, was expressed by Professor J. D. Bernal in a lecture describing his recent visit to Russia.

The professor was speaking at a meeting sponsored by the Society for Cultural Relations with the U.S.S.R. at Beaver Hall, Mansion House, London, last Saturday, and was introduced by Mr. J. G. Crowther, who observed that the professor was the first British scientist to visit Russia in the last ten years.

Crystallography

Among the great variety of subjects studied in the new department of crystallography of special interest was that of the growing of crystals in connection with the preparation of artificial quartz and other crystals for piezo-electric oscillations. There, he declared, he saw some of the most beautiful pictures of step-like and spiral growth that he had ever seen. Much of the laboratory was devoted to the study of mineral structure and X-ray methods were being extensively used. It was interesting to find, in contrast to his previous visit, that all the apparatus was Soviet-made and of excellent quality, including sealed X-ray tubes.

The professor also visited the laboratory of Prof. Oparin, where discussions were held on the light bio-chemistry could throw on the origin of life. There he also met Prof. Talmud and Dr. Bressler, from Leningrad, and heard of their work in his own field, the structure of proteins. He found that not only had they made a systematical chemical attack on the different kind of forces holding protein molecules together, but they had resynthesised soluble proteins from their constituent amino acids by the use of high pressure. "This was certainly one of the most exciting scientific discoveries of recent years."

Prof. Bernal contrasted what was being done here to utilise Scottish peat with the advance being made in the U.S.S.R. to utilise its vast peat resources. Waxes, he said, were being extracted from the peat which was also synthesised into refined fuel products and integrated chemical derivatives.

The general scientific policy of the Soviet Union was discussed with Prof. Vavilov, president of the Academy of Sciences.

Prof. Bernal answered a number of questions from his large audience.

Science in schools, he declared, was given a high place in the curriculum. While the ten-year school (up to 17 years of age) was universal, over 60 per cent in the towns continued further education up to the age of 21.

The professor caused some laughter replying to the question "What proportion of women are interested in science in the U.S.S.R.?" "Women," he said, "were 'dangerously predominant' in the Union, and took part in everything."

The problem of pursuing scientific research which did not accord with the views accepted by the State was raised. Prof. Bernal said that in some directions, such as biochemistry and the Freudian theory, new ideas had been evolved and the former theories were therefore considered incorrect and could not be pursued. He claimed, however, that only general tasks were laid down, the strategy being in the hands of the scientists themselves.

NORWAY'S ROCK WOOL

Technical Improvements

THE Norwegian concern A/S Elektrokemisk, which has experimented in producing wool from rock for the last 15 years, has established a new plant at Moss which incorporates the latest technical improvements and devices. The annual capacity of the rock wool industry in Norway is now 15,000 tons of raw wool.

Rock of suitable composition is crushed and then smelted in furnaces to an easy flowing mass. This is then projected through an orifice and divided into two or more jets and exposed to a blast of compressed air or steam, which converts it into very small globules and propels it into a "blowing room." Friction and resistance of the air forms the white-glowing globules into thin fibres, which congeal into a tangled wool-like mass.

It is an excellent insulating material, containing about 95 per cent entrapped air, and its fire-resisting properties have secured its adoption as an insulator for oil refineries. The wool mass is also processed into other forms, such as felt. For retaining and excluding heat, and as a sound insulator, the rock wool material is extremely effective. Norway is now exporting a good deal of the raw rock wool.

COAL TAR RESEARCH

Association's New Programme.

CONVERSION of what was formerly a small arms ammunition factory into research laboratories at Gomersal was reported at the first annual general meeting of the Coal Tar Research Association held recently in London.

Practically the full complement of research staff has been engaged and during the next few weeks a number of members of the staff will be spending periods of a week or a fortnight at the works of various tar distillers so as to acquire some industrial background in anticipation of the completion of all the laboratories and the start of research work on a full scale.

The association is sponsoring extramural work at Leeds University, Glasgow Royal Technical College and Heriot-Watt College, Edinburgh, respectively. Meanwhile the director, in consultation with the research committee of the council, has drawn up a programme of research work to be undertaken at Gomersal and this programme has been accepted by the council.

The work involved is based on the practical outlook upon the industry and its present problems. With the exception of that section of the work which will deal with what might be called " process problems," the main emphasis is on the search for fresh outlets for pitch and creosote by the application of new techniques.

The Technical Intelligence and Information services are dealing with an increasing number of inquiries, and have issued to members a number of translations of foreign papers.

Dr. E. V. Evans, first president, and Mr. H. H. Bates, honorary treasurer, were re-elected for a further twelve months as were all retiring members of the council At a meeting of the council held later in the day Mr. Richard Robinson was unanimously re-elected as chairman.

Sulphuric Acid Decontrolled

The Board of Trade have issued an Order (The Sulphuric Acid Prices Order, 1949), which removes from Statutory control the production and distribution of sulphuric acid, and provides only for maximum prices based on those charged in the period April 1 to June 30, 1949. The Order will come into effect on October 24.

WISE USE OF FUEL

Example Shown by Institute

AT the annual dinner of the Institute of Fuel, in London last week, the Melchett Medal was presented to Sir Frank Whittle, pioneer of jet propulsion, by the president, Dr. D. T. A. Townend.

Later, proposing the toast of the guests, Dr. Townend expressed the pleasure felt at having as their principal guests Lord McGowan and Lady McGowan. Lord McGowan had ties of long standing with the institute, and had served as president. The great company over which Lord McGowan presided had set an example in the development and application of new methods for the better utilisation of fuel.

Responding to the toast, Lord McGowan emphasised that the correct use of the nation's limited fuel resources was of cardinal importance to future prosperity. In the past, coal had been our main capital asset, but we had tended to use it wastefully, and we were now faced, not only with an insufficient volume of production, but with costs which had risen out of all proportion to the general increase in prices. The shortfall in production had entailed a serious loss of exports which would have helped to balance our overseas trade.

The results of the coal crisis of 1946-47 would have been far more damaging to the national economy but for the improved efficiency of coal consumption which had been achieved as the result of the fuel economy campaign, in which the members of the Institute of Fuel had played so notable a part.

Although coal consumption was to-day no more than in 1938, industrial production had greatly increased, despite the fact that a good deal of the coal now being supplied had a lower calorific value.

Much remained to be done in fuel economy, and here he was sure that the institute would continue to give a lead. Industry should be far quicker in applying new knowledge to both design and process work.

New Professorships

Nearly 250 applications have been received for the first 12 professorships at the New University College of North Staffordshire. Decisions of the selection committee are expected about the beginning of December.

NATIONALISM AND EXPORTS

A Reader's View

SIR,—I am not sure that sufficient distinction is always made between nationalised industries fairly safe from foreign competition, such as transport, gas, electricity, and possibly coal, and those largely concerned in export trade. Although the higher costs of transport, etc., since it has been nationalised, are undoubtedly a serious additional burden on our manufacturing industries, this is perhaps trifling compared with the damage to our export trade likely to arise by nationalising, say, the chemical or the iron and steel industries.

It is practically certain that management costs would, as in other cases, rise considerably, while efficiency and all those great qualities associated with free enterprise and progress would be stifled under the cold, dead hand of bureaucracy. There is little doubt that our ability to compete in the world's export markets, against ever keener rivalry from other countries, would be weakened. And yet, while threatening nationalisation, the Government urges more export!

I have some knowledge of the chemical industries, and while they are quite capable of speaking for themselves without my help, I think it is generally agreed that they are among the most efficient and progressive of any in this country, or elsewhere. None, I suggest, devotes more effort and money to research, improving products, lowering prices, and maintaining good wages and working conditions.

These industries are remarkably free from strikes, and the workers are eminently loyal and intelligent; that is to say, they realise the importance of export markets, and if ability to compete therein is prejudiced, *e.g.*, by the nationalising mania, there is serious risk of unemployment.

There is no sense or reason in or the slightest justification for nationalisation of the chemical industry: on the contrary, there is everything to be said against it. I should say the same applies to the iron and steel industry.—Yours, etc.,

(*Name and address supplied*).

Services of Science

Workers at Fort Dunlop's research centre broadcast last week a feature in the Midland Home Service, "Scientists and You," dealing with the benefits which modern developments have brought to the community.

MALADMINISTRATION

Industrialists' View of Government

SPEAKING as chairman at the luncheon of the Society for Indicidual Freedom, in London, on October 13, Sir Ernest Benn (president) said, but for the regretted indisposition of the Earl of Selborne, they would have had "a mass attack" by the House of Lords—that institution to which, they would all agree, the country looked for what little sense was to be found today.

The masses were being fed with something which was so deceitfully called "full employment," which was in reality half work for twice the money, and the country found men to go to America and tell them that we were doing our best. "But we are not doing our best, and we know it!" declared Sir Ernest.

Britain's High Prestige

Lord Lyle of Westbourne said he was not going to deal with the crisis as it affected us abroad, but with the economic crisis at home. Mr. Aneurin Bevan had recently endeavoured to prove that the Tories had handed over to the Socialists in 1945 a bankrupt country. We certainly finished the war in an exhausted condition, but the prestige of Britain never stood higher than it did in 1945. Our prestige stood high and the name of Britain stood high. He did not think the same could be said of Britain to-day.

The Socialist Government had placed on the people innumerable burdens, not the least of which was the food subsidies of £468 millions a year, and at the same time was attempting to establish a Welfare State. Another burden which the nation had to bear was the £380 millions a year for family allowances. There was a very great desire on the part of the trade unions to raise wages and shorten hours, and longer holidays with pay had been established. No one was more in favour of the Welfare State than he was; he would like a little welfare himself. All those things were excellent institutions, and actually his own company (Tate & Lyle) had established them many years ago, and they paid higher than trade union rates!

Unfortunately, higher wages did not necessarily mean an increase of output and increased efficiency, and practically all these higher charges on the country's industry had been reflected in higher costs

There had been an enormous diversion of effort caused by the threats of nationalisation.

NEW DOULTON CHEMICAL LABORATORIES

Exacting Need of Rapid Materials Control

AN event capable of having important effects upon the future of ceramic chemistry was the official opening on October 13 of the new laboratories of Doulton & Co., Ltd., Tamworth, Staffs. The ceremony was performed by one of the ceramic industry's leading scientists, Dr. H. W. Webb, Principal of the North Staffs Technical College, Stoke-on-Trent. Present were chemists from the firm's factories at Burslem, Lambeth, Dudley, Tamworth, and Stoke, and Mr. S. R. Hind, technical adviser to all Doulton branches. Guests included Mr. H. N. Jepson, architect, and Mr. H. Astbury, representing the Cambridge Instrument Co.

The morning programme consisted first of the presentation and discussion (under the chairmanship of Mr. Hind) of five papers, *viz.*: "Routine Ceramic Testing at Wilnecote Works," by D. B. Binns; "Rational Interpretation of Analyses of Clays," by L. E. Shipley; "Specific Surface Measurement with Special Reference to Light Absorption Methods," by A. E. Moore; "Earthenware Casting Slip Control," by G. D. Horley; and "A New Aspect of the Chemical Control of Ceramic Production," by S. R. Hind.

Pioneers in Research

After lunch at the Wilnecote Parish Hall, Mr. Hind greeted guests and fellow colleagues, and introduced the guest of honour, Dr. Webb. In a brief informal address, Dr. Webb said the work that Doultons were doing in this field was of great interest to him. Objective industrial chemical research of this kind was much more efficient, in his opinion, than Government research, which lacked the spur of the practical man and his production line. Doultons had been the pioneers in ceramic works research. He felt that the outlook shown by the company's directors in promoting research ensured that the organisation would go from success to success.

Mr. P. Berrisford, the Tamworth works manager, spoke of the time lag between investigations and the final result. Management was more interested in the practical side and post-mortems were not required.

Of topical interest during the morning session was Mr. Binns' paper dealing with the functions of the new laboratory. Its primary rôle, he said, was to maintain the quality of the Doulton products associated with the Tamworth works, chemical stoneware, drain-pipes, electrical insulators, etc. The key lay in the raw materials which would be tested in segregated batches, representative samples being taken from each. Work would include tests for moisture content, particle size, loss on ignition, and decisive tests (based on the properties of the final product) to accept or reject a given material. Trial firings would form an important part of the work.

Losses

The fact that immense losses were still incurred from time to time, he said, in this department of the ceramics industry was recognised in the paper by Mr. S. R. Hind. These would come from deviations from standard qualities such as incorrect porosity, inadequate strength, crazing or peeling of glaze, non-matching colour, lack of gloss on glaze, etc. Production processes had much to do with such faults. Appropriate physical tests were therefore applied to ensure that factory technique in the forming, drying, glazing, decorating, and firing were correctly conducted. It was still repeatedly being found, however, that some of the most serious troubles arose from unforeseen variations in the basic raw materials and their blending.

Chemical Constants

All the bodies used for the manufacture of the wide range of Doulton products relied intimately on the constancy of chemical composition of various natural clays, felspars, felspathic materials such as Cornish stone, and flint or quartz, together with bone ash in the case of bone china. Their chemical composition varied constantly—sometimes to such an extent as to create a serious danger.

A stranger to the industry would assume that this quality would be under regular and close supervision.

Mr. Hind recalled the simpler but comparable case of the Portland cement industry, whose rise to its present vast proportions and high profitability was based on the work of chemists. Having established the correct composition of the finished product, they instituted rigid chemical control of the variable raw materials, and their consequent accurate compounding to a mixture of constant analysis. Unlike the ceramic industry, their problems were simpler, and within the current scope of laboratory technique, both with regard to method and the necessary rapidity with which results were forthcoming for control purposes.

Problems of Analysis

If requests were made to any reputable supplier of the ceramic industry's chief raw materials, ball clay, china clay, Cornish stone, or stoneware clay, for the analysis of any batch in current supply, the information supplied would relate to analyses made years ago, on a single sample taken from supplies then in production.

The industry knew that such information was grossly inadequate. But more detailed and up-to-date information if sought from laboratories engaged in this work often took several weeks and cost more than £5 per sample. Moreover, the capacity of such laboratories was too small at present to cope with any large number of samples daily.

Adequate analysis of raw materials within the Doulton organisation would be found to involve an average of four complete silicate analyses daily per factory (*i.e.*, 30 for the entire organisation) necessary for good chemical control. This would amount to about 7500 analyses per annum. It was not conceivable, said Mr. Hind, that this would cost less than £30,000 and employ over 100 analysts. Worse than this was the fact that these analyses would not be available until a week after each sample had been submitted—in some cases longer still. This would cause too much material to be held in stock awaiting authorisation to proceed with production.

Substitute Devices

Mr. Hind went on to outline the substitute devices and assumptions with which, at present, the industry had to be content. He had purposely refrained from considering the work involved in a similarly full attack on the control of glaze materials, engobes and colours. This would be subject to the same disabilities.

If the ceramic manufacturer felt that the aspects of chemical control, which he (Mr. Hind) had attempted to portray, seemed unfamiliar and perhaps grossly exaggerated, such a manufacturer should review the past history of his own business, and recall the many occasions on which, for unaccountable reasons, the profitability of his business had completely disappeared for a time.

It had to be remembered, said Mr. Hind, that in coping with the difficulty of maintaining sound production with so many unknown factors to contend with, the industry had been driven into an extremely conservative attitude, and new processes, bodies, and products were subject to extremely slow development.

In view of recent advances in spectroscopic analysis, however, Mr. Hind did not think that these obstacles to full chemical knowledge of the industry's raw materials and products need persist much longer. The prospect was that, very soon, it would be possible to obtain fully adequate control data by this method in a few hours per sample, and at a rate of many samples per day from a single skilled operative and one set of equipment.

Spectrographic Method

Mr. Hind said he had noted that the spectrographic method of analysis was already in universal use in the field of production control associated with the manufacture of alloys. In the ceramic industry, however, difficulties had been greater, and development slower. A paper published two years ago by Zander and Terry in "The Transactions of the American Ceramic Society," described their successful application of rapid spectroscopic analysis to the control of the production of vitreous enamels. Success had been claimed with such materials as felspar, zircon, and fluorspar.

At Doultons there had been collaboration for some time with Hilger & Watts, which had resulted in the employment of Dr. W. Czapska for the past six months in developing the spectroscopic method. It was too early to say that all the difficulties had been surmounted, but there seemed little doubt as to the ultimate outcome.

The purpose of his paper, said Mr. Hind, was to emphasise the extent to which the firm suffered from the great expense and "intolerable slowness" of classical analytical chemistry in the service of ceramics. This perpetuated a state of inadequate control of production, with great risk of serious manufacturing loss from time to time, and a restriction of the usefulness of the scientist in the ceramic industry, and to a rigidity which retarded progress.

SCOPE AND PROSPECTS FOR CHEMICAL INDUSTRY

Close Integration with National Policies

THE existing responsibilities falling to the Association of British Chemical Manufacturers, resulting from the intimate interest of various departments of the Government in industrial affairs, are reflected in the association's 33rd annual report, and in the remarks made by the chairman, Sir Harry Jephcott, proposing its adoption at the association's annual general meeting last week.

He referred to several matters of general interest to chemical industry and revealed that an "enormous amount of work" had been required of the association, kindred associations and some 270 individual manufacturers to prepare for the President of the Board of Trade the report on chemical industry, now completed and about to be presented.

Summarising some other topics of special interest outlined in the report, Sir Harry Jephcott mentioned the approaching departure to the U.S.A. of a "productivity team" formed by the Fertiliser Manufacturers' Association and the preparations which had been made to send out a team in the interests of the dyestuffs industry.

The report, discussing the utility of the chemicals section of the current year's BIF, looks forward to the possibility of holding, in 1952, a chemicals and chemical plant exhibition, distinct from the BIF.

Direct Exports

Reviewing progress made in the direct export of chemicals, Sir Harry Jephcott said the industry was entitled to be proud of what it had done. The evidence was to be found in export increases between 1938 and 1948 of 56 per cent by volume, and of value from £22 million to nearly £84 million in the ten years. The export of chemicals to the value of £44 million in the first six months of this year had heightened the trend.

He considered that the industry could, however, have done much more had its schemes of rehabilitation and expansion been sanctioned promptly by the Government after the end of the war. It was satisfactory to know that many of the schemes had now been authorised and should be coming to fruition next year, and would give an increased output to meet the requirements of home industries and the export markets. Existing plants were practically all working to full capacity.

That there was still a big overseas demand for chemicals was indicated by the recent American announcement that their exports of chemicals in the first six months of 1949 reached the record figure of $450 million, despite dollar shortages in practically all foreign countries. "The Americans," he said, "claim that this indicates a preference for their chemical products because of better quality and lower prices. We disagree with this statement as to quality, though it may be true as regards price. Our exchange adjustment should enable us to improve our competitive position and to increase our trade to non-dollar areas as additional supplies become available from the new plants.

Dollar Earnings

"It has been argued that we shall be able substantially to increase our earnings in the dollar area because of our improved competitive position. A simple calculation will show that, if we maintain our present export prices in sterling, we shall have to increase the volume of our exports by 44 per cent to earn the same number of dollars as we did before the adjustment took place. Even if we increase sterling prices by 20 per cent, we shall still need a 20 per cent increase in volume to earn the same amount in dollars.

"Where are we to get this extra volume of goods? We can only get it by increased output, unless we starve the home consumer or switch our goods from other established markets. In the chemical industry we have obeyed the Government instruction to intensify our efforts in the dollar area and we will continue to do so. The prospects of chemical exports to the United States are far from rosy, except for a limited number of coal tar products, which the American industry requires as raw materials, and for certain specialised products that have been developed here. For the general run of chemicals, the United States can rely on her own highly developed industry—now the largest in the world—having access to an abundance of most raw materials and protected by an import tariff, which, as administered, amounts to a virtual prohibition on many classes of synthetic organic chemicals. There will be much better opportunities in other parts of the dollar area and I am sure all members will do their best to make full use of them.

"On the other hand, the exchange adjustment will be a serious handicap in purchasing those raw materials that we must buy on the American continent. Sulphur is an outstanding example.

"While we cannot be optimistic about improving our position as dollar earners, we can confidently hope from the new expansion schemes, especially those relating to the production of chemicals from petroleum, to play an increasingly important rôle as dollar savers by manufacturing ourselves most of the chemicals we have now to buy from the States."

Import Licensing

Another important factor was the recent removal of U.K. import licensing restrictions on, *inter alia*, chemicals, drugs and medicines. While the British Government had taken the initiative in the matter, other countries were under an obligation to follow suit and some had already done so.

"While we may expect greater competition from foreign chemicals," said the chairman, "we can hope for better facilities for extending our trade in the OEEC and other areas. This should be an added stimulus—if such be needed—to our members to increase their productivity, cut their costs and intensify their selling exertions to the ultimate advantage of the industry and the country. Once again we shall have an opportunity of developing that free competitive initiative that is essential to success and has for so long been discouraged by Government controls, both here and abroad, the strict limitation of imports and the existence of a sellers' market. But, while 'opportunity knocks,' 'opportunity never knocks twice.'

"We are now faced with what is in effect an economic Dunkirk. The courage, leadership, team spirit and hard work that enabled us to surmount the odds facing us in 1940 will be required in at least equal measure if we are to fight our way out of our present difficulties. The unpopular doctrine of harder work and greater economy from every member of the community has still to be brought home to the mass of the people."

The report recalls the initiation by the President of the Board of Trade, in Sepber last year, of the proposal that the ABCM should provide "a comprehensive survey of chemical industry." The association accepted the invitation, although it recognised the many difficulties involved, particularly in regard to what scope such a review should have. The association concluded that a survey of development plans in general would not suffice and that the relationship between the chemical, and other, industries and the inter-relationship of sections within chemical industry were among the other factors which should be considered.

It was finally agreed with the President of the Board of Trade that broadly the review should cover heavy chemicals, industrial gases, fertilisers, dyestuffs, medicinal and other fine chemicals, indusdustrial explosives, and plastics and synthetic resins, but not the compounding of chemicals to make such products as paints, insecticides, sheep and cattle dips and pharmaceutical preparations.

Thus the activities of many chemical firms will be partly in and partly outside the scope of the report and a large number of those generally regarded as part of the chemical industry are entirely excluded. The Government departments concerned decided that any inquiry into the tar distillation industry, normally regarded as an integral part of the chemical industry, should be undertaken by the Ministry of Fuel and Power.

The following associations had co-operated with the ABCM in preparing the report: The British Colour Makers' Association, British Sulphate of Ammonia Federation, Ltd., The National Sulphuric Acid Association, Ltd., British Plasttics Federaion, and the Superphosphate Manufacturers' Association, Ltd.

Report Committee

To prepare the report, the deputation to the President of the Board of Trade was authorised by the council to act as a committee, which determined the nature of the inquiry. This was made not only among members but also with a number of firms who are not members of the associations mentioned.

The ABCM council recalls that practically everyone operating within the defined field replied to the questionnaire, and a large mass of valuable data was obtained.

By June 30, the greater part of the report was ready for the printer and the confidential appendices, to be seen only by the Board of Trade, setting out for each firm, under a code number, its research programme in general terms, its schemes for extending its research and development facilities, and its detailed plans for the expansion and rehabilitation of production, over the next five years, were in printer's proof. The report will be confidential to the President of the Board of Trade and will remain so until publication of it may be agreed between the President of the Board of Trade and the council.

The association has been in close touch through the Federation of British Industries with the Anglo-American Council on Productivity. It welcomed the proposals that teams drawn from management, technicians and operatives should visit appropriate factories in the U.S.A. to study American organisation and methods, and use the information obtained in an endeavour to increase productivity in this country.

A joint committee with the Association of Chemical and Allied Employers agreed that it was desirable that productivity teams should be organised from the chemical industry and that the two associations should work together.

The ABCM was asked to undertake the organisation, on the basis that any members of the ACAE who were not members of the ABCM should be invited to the meetings when the subject was under discussion. It appeared probable that more than one team would be required.

The discussions had already removed initial misunderstandings. In particular, it was now appreciated that technical "know-how" in the sense of detailed information on chemical processes will not be made available to the teams nor will American teams expect to be given such information when they pay a return visit to this country. The aim was to have the teams from the chemical industry ready to go out next spring.

Measuring Productivity

The question of how productivity is to be defined and measured was occupying the attention of several members of the association.

On the subject of exhibitions and the BIF, the association's report recalls that the chemical section at this year's BIF was notable for a new type of lay-out which was generally regarded as a great improvement over those adopted previously. Most exhibitors reported a falling off in the number of inquiries received, but it was generally agreed that the proportion of genuine and substantial inquiries was higher than in previous post-war fairs.

A number of members had expressed the view that the British Industries Fair may not be the best exhibition medium for chemical products. Discussions had, therefore, been started with the British Chemical Plant Manufacturers' Association and other trade associations to explore the possibility of staging a combined exhibition by the chemical industries and the makers of their equipment, to be held at, say, three-yearly intervals. The present suggestion was that the first such exhibition might be held in 1952.

The association's report discusses the Patents and Designs Bill, on which it made a number of recommendations before the Bill was published in March, and concludes that the proposals "represent a desirable advance on existing legislation." It singles out for approval the provision which will permit the patenting of chemical compounds, as such, instead of only the method of manufacture. The association had recommended to the Swan Committee, which was primarily responsible for the draft, that provision should be made for granting chemical products patents.

Chemical Tariffs

Reviewing some aspects of overseas trading during the year, the association records that it had sought reduction or stabilisation of the chemical tariffs by the countries associated with the general agreement on tariffs and trade, reached in Geneva in 1947. The increase of bilateral agreements between Continental countries had been observed. Such agreements, to which the U.K. was a party, had called for chemical exports of substantially higher value than in 1948. Largely increased provision of chemicals was required in the current agreements with Argentina and Sweden.

Competition from Germany in chemicals had been closely watched and the association had taken up a number of cases concerning the export of chemicals and pharmaceuticals from Germany at unduly low prices.

Little progress had been made during this year in the distribution of chemical plant taken from Germany as reparations, and in a number of cases in which the coming availability of plant had been notified the small interest shown by manufacturers here had not justified the making of a bid by the U.K. The benefit from German reparations to British chemical industry had been negligible and was likely to remain so.

Brief references are made elsewhere in the report to several topics of general importance. On the subject of tar distillation products, which is primarily the responsibility of the Association of Tar Distillers, it is recorded that a proposal from the Ministry of Fuel had sought to place supply problems in the hands of a joint committee of producers and consumers under the chairmanship of the Ministry's by-products controller. That proposal had been unanimously resisted by the ATD and the ABCM.

The rising production of fine chemicals in the U.K. is noted in connection with the study of imports of chemicals under KID arrangements, and it is foreseen that a substantial reduction of fine chemical imports will be made possible by current schemes for expanding production here.

Similar gains have also been recorded in the field of dyestuffs and intermediates production, in which the operation of some new plant had helped to put an end to shortages experienced in 1948. Needs in this country were being met, except in regard to a few specific dyestuffs. Development schemes to repair that deficiency were in hand. An export target for this year of £750,000 monthly had been agreed with the Board of Trade.

A considerable part of the association's work during the year was associated with the subject of safeguarding chemical workers. Comparative tests had been made of British and American detector tubes for indicating the presence of carbon monoxide, and comparison of the methods of (1) colour matching and (2) measuring the length of a stain had resulted in a strong preference for the latter. Further tests are to estimate the probable accuracy of the determination by these tubes. Responsibility for reviewing tests for toxic gases in industry belonged to the Department of Scientific and Industrial Research, and the association had recommended to the Chief Inspector of Factories a list of six gases deserving early attention. These were gases or gaseous products of benzene, chlorinated hydrocarbons, chlorine, hydrogen chloride, hydrogen cyanide, hydrogen fluoride and sulphur dioxide.

Chemical Manufacturers' Dinner

"U.K. Industrial Research as Large as Any."

SIR ROBERT ROBINSON, president of the Royal Society, and Sir Archibald Rowlands, permanent secretary of the Ministry of Supply, were among the principal guests at the annual dinner in London on October 12, of the Association of British Chemical Manufacturers. Both made lively and constructive contributions to the after-dinner speeches, before one of the largest gatherings mustered by the association since the war. Sir Harry Jephcott, chairman of the ABCM, presided and gave an interesting commentary on industry's great modern activity in the field of research, with which Sir Robert Robinson had dealt from the standpoint of the universities.

The latter, proposing the toast of "The Association," invited the ABCM to use its influence in a practical matter in which it could be of great assistance—the duties on hydrocarbon oils. Very soon the question would have to be discussed whether the duties on these oils should be relaxed. Having in mind the vast importance to chemical industry of the chemical products derived from hydrocarbon oils, it seemed to him of the greatest importance that the Government should be induced to discontinue these duties and to give a chance to an industry which was in the early stages of its development.

Of the research functions of the universities, Sir Robert Robinson called to mind the fact that the overriding responsibility of the universities was to train students, and they were having the greatest difficulty in performing that function adequately in relation to the present great demand for scientists to carry on research. In the furtherance of research, industry enjoyed many advantages, seeking the solution of particular problems and commanding greater resources in laboratory equipment and workers. It was a commonplace in university research that anyone having an outstanding assistant in the laboratory was very shortly going to lose him.

It was essential that the universities should be left to follow their own lines of research and the likelihood was that discoveries of value to industry would continue to be made. Industry would undoubtedly take advantage of all such discoveries, develop them further and take out the patents! As evidence that industry was, however, not always content only to take, Sir Robert Robinson mentioned the practical assistance which had been given by Boots Pure Drug Company, British Drug Houses and others to the university department which was trying to do something quite off the usual university line—to synthesise colesterol. One industrial group had made available 500 gm. of a substance very difficult to make, which would have taken months to produce in the university laboratory.

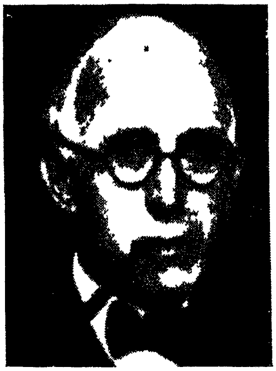
He urged that industry should continue to manage its own research problems. "Don't give *ad hoc* research to the universities," he pleaded, "but support them with all your might and main."

Sir Harry Jephcott replied to the toast. He concurred with the view of the president of the Royal Society that industry must shoulder its own research problems, yet it needed to keep in very close touch with what was being done in the universities. Proof that chemical industry was playing in full its part in research was conveyed in information made available by members of the ABCM and others Each member firm maintained a research staff, having a defined programme, and the chemical development and research programme in the aggregate was at least as large as that of any other industry in the country—probably larger. He could demonstrate that at the end of 1948 chemical industry was spending on research and development not less than £8.5 million annually; and these were not capital costs but out-of-pocket annual expenditure. In addition, the industry had in hand projects for capital expenditure of £8.3 million to provide further facilities of the same kind.

When new facilities were available, the industry proposed spending a further £3 million annually on research. That would give the very substantial sum of £11.5 million a year for research.

According to a report by the National Association of Manufacturers in America, manufacturers of chemical and allied products there were spending 1.83 per cent of their turnover on research in 1947. In 1939 it had been 3.17 per cent. No exact figure for sales by chemical industry here could be arrived at, but it could be said with assurance that the ratio of research expenditure to sales certainly exceeded 2.5 per cent, and was probably 2.7 per cent. Industry here not only believed in research: it backed it with substantial sums.

Sir Robert Robinson



Sir Harry Jephcott

The chairman foresaw that industry as a whole might at some time be charged with extravagant use of research workers; they numbered more than 10,000 today and would probably total 13,000 in years to come. The answer to that was that industry was conducted by people who knew their own business, who would not incur large expenditure without proper control and the conviction that in due course results would repay the cost.

Acknowledging the real benefits chemical industry received from the indirect results of research in the universities and colleges, the chairman stressed the need for prompt and full publication. If each member company would contribute to the funds of the Chemical Council one half of one per cent of its research budget the problem of meeting the increased publication costs borne by the scientific societies would be solved.

Sir Frederick Bain, vice-chairman of the association, proposed the toast of "The Guests," cordially acknowledging the great work performed by Sir Robert Robinson, as a scientist "and in making science and the humanities one."

Sir Archibald Rowlands, responding to the toast, warmly thanked the ABCM, on behalf of Government departments, for its cordial help. He was, he said, reluctant to indulge in the meretricious arts of propaganda, but he looked to the chemical manufacturers to emulate their forebears the alchemists—by transmitting base raw material into golden dollars.

DEVELOPMENT OF A NEW EXPLOSIVE

Safety Without Sheathing

A VALUABLE development in coal mining explosives is represented by the recent introduction of the explosive Unibel, manufactured by Imperial Chemical Industries, Ltd.

No explosive may be used in a gassy or dusty coal mine until it has been tested by the Ministry of Fuel and Power and proved to reach a defined standard of safety as regards the hazards of ignition of firedamp and coal dust. Those accepted are certified as "Permitted Explosives." As an additional safety measure, "Sheathed" Permitted explosive was introduced in 1934. In that category, each cartridge is enclosed in sheath of inert material which is dispersed on detonation and serves to reduce still further the risk of firedamp ignitions.

New Classification

The new Unibel explosive is designed to be equivalent in safety and performance to a Sheathed Permitted Explosive (Polar Dynobel No. 2). This has been recognised and certified by the Ministry of Fuel and Power and, as a result, a new classification of explosives for coal mining—"Eq.S" (Equivalent to Sheathed)—has been introduced. This will be applicable to any future explosive proved to be equivalent in safety to a sheathed explosive of the same group.

The new development has arisen out of many years' investigations into the factors affecting the safety of explosives when fired under different conditions in presence of methane-air mixtures. It has been the subject of prolonged testing, both at the Ardeer testing station of I.C.I., Ltd., and by the Safety in Mines research and testing branch of the Ministry of Fuel at Buxton. The equivalence in safety has been assessed by a wide range of gallery tests carried out in methane-air mixtures.

Laboratory tests have shown that its overall strength is similar to that of Sheathed Polar Dynobel No. 2 and practical tests in coal mines have proved that the blasting results are also very similar.

The nature of Unibel can best be described briefly by saying that the cooling material which would normally be contained in the sheath is incorporated directly and uniformly into the explosive itself. Having no sheath which can be stripped off, accidentally or otherwise, to the detriment of the safety of the charge, is a marked advantage.

The research work and the fundamental studies leading to the introduction of this new type of explosive were described in a paper delivered by Dr. J. Taylor, research director of the Nobel Division of I.C.I., Ltd., to the Mining Institute of Scotland in Edinburgh last month.

[Courtesy, I.C.I., Ltd.

The explosive is fired from the cannon (left), into an atmosphere of methane and air, so that the test reproduces the effect of a "blown out" shot in a coal mine

THE CHEMIST AND RUBBER CABLES

*Development of Organic Accelerators of Vulcanisation**

by B. B. EVANS

FOR an understanding of the technology of rubber and allied materials the chemist must reinforce classical organic chemistry by modern physical conceptions. The reason for this is that, while the former will explain some of the properties of natural and synthetic rubbers, the physical properties on which the technology of the materials in the factory and their subsequent use depend are a consequence of their long chain structure.

Rubber in its raw state is tough and relatively intractable, due to the interweaving of the long chains; its softening by mastication, which is a necessary preliminary to the incorporation of vulcanising and other ingredients, is due essentially to chain shortening by oxygen fission. Subsequent vulcanisation, in which the compound is changed from a plastic to an elastic state, arises from the cross-linking of the chains by the vulcanising agent, usually, but not necessarily, sulphur, so that the chains resist deformation, and return to their original position when the deforming force is removed.

Somewhat similar remarks apply to compounding and reinforcing agents, for although these must be free from undesirable chemical constituents, *e.g.*, copper and manganese, which would catalyse oxidation, and electrolytes in the case of ingredients intended for dielectrics, the basic reason for which compounding ingredients are used is to impart special physical characteristics to the compound. All these effects again depend on the particle shape and size and nature of the surface of the materials.

Organic Accelerators

Improvements in rubber cables have arisen from chemists' work in the development of organic accelerators of vulcanisation, anti-oxygens, and the development of various types of carbon black for reinforcement.

It is probable that organic accelerators function by modifying the nature of the sulphur/carbon linking, but the practical results which follow their use are that rubber/sulphur ratios can be much reduced, and the time of vulcanisation considerably shortened. These, in their turn, tend towards better ageing of the vulcanised rubber, and less effect on the tinned copper conductor.

Organic accelerators for dielectrics must be chosen with care, however, so as to avoid decentralisation of conductor during the early stages of cure, adhesion of vulcanised rubber to the conductor, which would lead to difficulties during installation of cable and the lowering of insulation resistance below values specified in Institute of Electrical Engineers' wiring rules and B.S.7.

Preventing Oxidation

Deterioration in both electrical and physical properties of rubber arises from oxidation. In certain types of installation this can be countered by preventing access of air to the rubber, but the more general step is to include an anti-oxygen in the compound, β naphthylamine being a common example. It is believed that these decompose the peroxide formed in the early stages of rubber oxidation, and so prevent the subsequent chain reaction.

A big improvement in the protection against mechanical damage imparted by heavy duty sheathing used on trailing cables for mines has followed the replacement of earlier mineral reinforcing agents by the various grades of carbon black, this being due principally to the very small particle size of the latter.

There is no product commercially available which is synthetic rubber in the sense of being a man-made reproduction of the natural product. Most of the so-called synthetic rubbers are more correctly described as long chain polymers, usually amenable to similar manufacturing technique to that employed for natural rubber, produced from monomers chemically related to butadiene, but often containing substituent or additive chemical groupings which confer superiority over natural rubber in particular respects, such as resistance to oil, fire and weather.

During the war, some of these, notably a special washed dielectric grade of American GRS (butadiene/styrene copolymer), polychloroprene (polymerised chloro-2-butadiene) and thiokol (ethylene tetrasulphide produced in this country), were used as substitutes for natural rubber following the loss of Malaya. The

(*Continued overleaf*)

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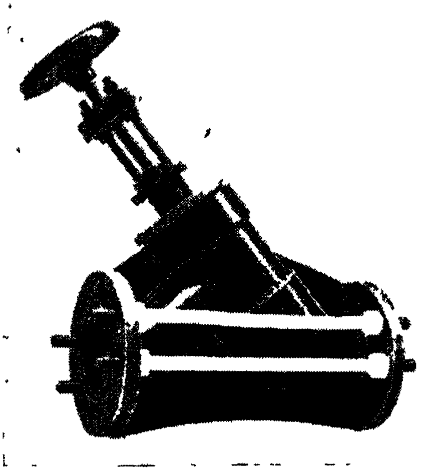
* Summary of paper read before the London and South Eastern Counties Section of the Royal Institute of Chemistry.

PVC Chemical Equipment

Promising Alternatives to Metals



[Courtesy, Tanks & Linings, Ltd.

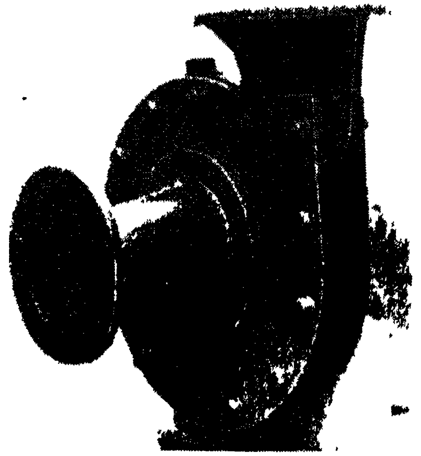
Examples of plastic pumps (above and right), made from PVC

ONE of the practical benefits accruing from the post-war use of German technology is exemplified by the production of a wide range of chemical appliances, vessels and ducts employing completely unplasticised polyvinylchloride, the German form of which (Vinidur) found much use during the war.

A British equivalent, Nutradur, has now been fully developed and has been found to be exceptionally adaptable and highly resistant. Among its more promising characteristics are the readiness with which it can be fabricated into relatively intricate forms and the consequent economy which that permits. These qualities are especially helpful in the production of valves and pumps, in which the thermoplastic synthetic may in a number of cases replace more expensive materials, such as deal alloys and stainless steel. The unplasticised resin is stated to have very high shock resistance and to be unaffected by most chemicals, other than solvents.

Adaptable Material

It is a considerable advantage that the material is most amenable to processing; it can be sawn, dulled and machined, welded by hot air torch and formed into almost any simple shape by heat treatment (about 120°C.). Tensile strength is around 9000 p.s.i. at 15°C. and compressive strength some 10,000 p.s.i. The specific gravity of this form of PVC is 1038, thermal conductivity 3 by 10^{-4} cal./sec. Cm^2 °C.cm. Water absorption is stated to be 0.5 per cent in 24 hours and the dielectric constant at 1 mc./sec. 3.2 to 3.4.



THE CHEMIST AND RUBBER CABLES

(Continued from previous page)

only one now used, however, is polychloroprene, in which the chlorine content renders the material self extinguishing and oil resistant.

Examples of its use are as a component of a fire-resisting dielectric in ship-wiring cables; it is used in place of natural rubber for the fire-resisting, heavy-duty sheath on trailing cables in coal mines, as a body fat-resisting sheath for miners' cap-lamp flexibles, and as a fire- and oil-resisting covering on aircraft cables.

The latest silicone rubbers, although being very weak mechanically, have extremely good resistance to temperatures even of the order of 150°C., due to the silicone/oxygen linking of the backbone of the long chain polymer, and are finding special applications in high temperature ignition cables for aircraft and the wiring of brick kilns.

MICROCHEMICAL BALANCES

*Their Essentiality Recognised in Nottingham Symposium**

THE essential function of the microchemical balance in the work of all microchemists was recognised in the course of a symposium in Nottingham last month, intended to make more widely known current problems associated with their design and use and the contribution which the laboratory worker could make to their solution.

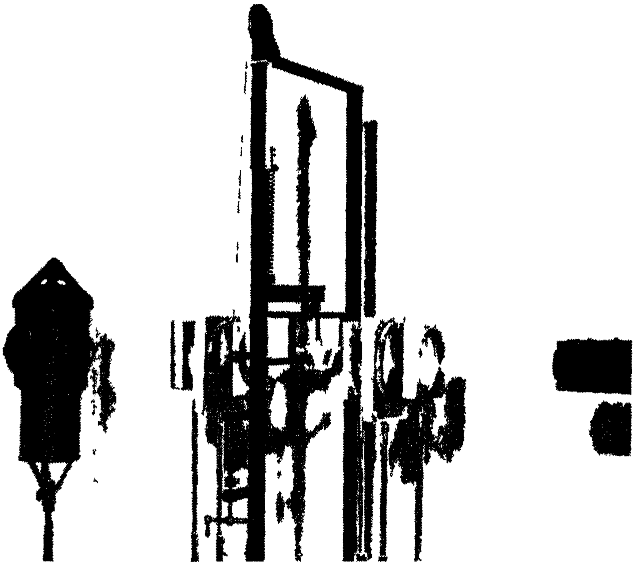
The subject was introduced by Dr. G. E. Hodsman (L. Oertling, Ltd.) who urged that the microchemist should be familiar with the principles underlying the construction of the microchemical balance. Only then could he obtain more efficient service from the instrument and also make the manufacturer familiar with his more detailed requirements, a *sine qua non* for the advance of balance design.

The formula relating the sensitivity of a balance to the position of the beam at equilibrium is fundamental to the whole design of the instrument. It can easily be shown from this formula that in the first place the central knife edges and the knife edges at the ends of the beam should lie in one straight line.

For increased sensitivity the beam arms should be as long as possible, while the total weight acting and the distance between the point of support of the beam and the centre of gravity of the system should be as small as possible. However, increase of the former increases the time of swing, so that a compromise must be made between a high sensitivity and a reasonably short time of swing.

Again, undue increase in beam length and in total assembly weight will affect the rigidity of the beam, incurring the risk of throwing the knife edges out of alignment. Once again a compromise is reached. Any demand for a new factor in beam design will probably necessitate a complete readjustment so as to reach a new compromise between all the variables.

Study of the wear between balance bearings is virtually in its infancy. It is known that the bearings must be hard, flat and and highly polished, while the ideal knife edge is infinitely thin. On wear, crushing of the knife edge takes



Model of beam in position on loading frame of photoelastic test apparatus for stress analysis of balance beams

(Courtesy of L. Oertling, Ltd.

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* Report of a joint meeting at Nottingham, Sept 22 of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists and the East Midlands Section of the Royal Institute of Chemistry

place, resulting in the formation of debris which fouls the bearing, leading to lack of reproducibility. In addition, the adjustment of the knife edges relative to each other is affected. It is now realised that in addition to possessing elasticity, the knife edge should be softer than the bearing plane.

Study of the importance of the rider bar and rider reveals two independent sources of error. The notching of the rider beam must be accurate to within 0.0005 in. to achieve reproducibility of 1 microgram. Progress has been made in this direction by the use of a tool which cuts all the notches simultaneously, rather than *seriatim.*

Dislocation Error

More troublesome is the possibility of dislocation error in lifting and replacing the rider. Indeed, the majority of weighing errors on the microchemical balance can be attributed to this. If the rider is not placed at the bottom of the notch to within 0.0005 in. an error of 1 microgram or more will result. In addition, the rider must not deviate from the normal to the beam by more than 10-12 minutes of arc. or an error of the same magnitude will result.

Possibly the best type of rider from the point of view of elimination of these errors is the quartz stick rider, but it, in turn, is open to objections on the grounds of difficulty of manipulation.

The beam must be highly resistant to corrosion, non-magnetic and free from strain. An interesting new development is the introduction of photo-elastic stress testing, using plastic models. The interpretation of the stress patterns is complex, but stress-free portions of the beam may be removed, thus leading to the construction of lighter beams.

The setting of the knife edges on the beam is highly critical. On a 5-in. beam each knife edge is set to within one-millionth of an inch. The difficulty of this adjustment becomes more obvious when it is realised that the setting is a three-dimensional one.

One point of importance both to the manufacturer and to the user is the disagreement of terminology in the manufacturers' literature. In specifying the performance of a balance two factors should be given; (1) the deflection in mm. per microgram, which should be as large as possible and (2) some precisely defined indication of the reproducibility, such as probable error or standard deviation. Microchemists are entitled to demand that manufacturers should clarify these points and place specifications on a firmer basis.

Anticipated future developments are naturally largely concerned with increase in accuracy, particularly in the weighing of small samples. It is not impossible that there may be complete abandonment of the rider principle and the calibrated graticule in favour of other methods. The quartz fibre technique of construction is also full of possibilities, while the application to weighing of a considerable range of physical principles, such as those used in electromagnetic balances and nuclear detectors, has already received some attention.

Mr. David W. Wilson (Sir John Cass Technical Institute) dealt with Maintenance and Precision of Mircobalances. Many users of microchemical balances are doubtful how far the maintenance of the microchemical balance can be provided on the spot, and how far it must be delegated to the manufacturer or supplier.

Briefly, it is accepted that the user should be capable of adjusting zero point, and also, if required, sensitivity. The latter operation, however, is tedious, and any serious deterioration in the sensitivity almost certainly indicates that the knife edges are at fault, and require expert attention.

Dismantling, cleaning and reassembling also fall within the user's province; this, however, should be carried out only when the precision of the balance falls outside the value required for the work, and should not constitute a routine operation at fixed intervals.

In no circumstances should the user attempt adjustments which involve the positioning of knife edges and planes; these are highly skilled operations.

Precision

The published work on the precision of the microchemical balance has not received the attention due to it. Since the microchemical balance is being used practically to the limit of precise functioning, the precision factor becomes a highly critical one in analytical operations.

Some measure of the spread of results over a series is required. The distance between the maximum and minimum values is not sufficient, since it takes no account of the variations in the intermediate results.

Probably the fairest estimate of producibility devised by statisticians is the standard deviation, although some workers prefer the probable error, which is 0.675 × standard deviation. For comparison of the performance of different balances there is, however, no need to apply the factor.

In addition, from standard deviation, σ, it is possible to determine directly the probability that future weighings performed under the same conditions will lie within certain multiples of σ. For example, 95 per cent of these should lie within $\pm$ 2 σ, while 99 per cent should lie within $\pm$ 2.6 σ and 99 per cent within $\pm$ 3 σ. In chemical work the first of these, $\pm$ 2 σ, which indicates that 19 out of 20 results will probably lie within the limits, is usually preferred.

If on a series of straightforward weighings, $\sigma = 1.15$ microgram, then 95 per cent of future weighings should lie within $\pm$ 2.3 micrograms. This affords some measure of precision, and hence of confidence limits. Consequently, we can derive the sample weight which will probably give a result falling within a desired error.

It must be remembered that the weighings must all be carried out under precisely the same conditions. Since weighings are in practice usually accompanied by a determination of the zero point, we are normally dealing with the difference of two weighings, both subject to the same type of random error.

If we assume the standard deviations for each set to be the same, then we can show that the total standard deviation for the difference is $\sqrt{2} \times$ standard deviation for one of the sets. The limits for the case quoted above now become $\pm$ 3.2 micrograms.

In summing up, four points may be made: (1) A standardised definition of precision is lacking; (2) There is not yet a correct evaluation of the definitions of precision used; (3) There is no standardised procedure for the determination of precision; (4) Manufacturers should quote some clearly defined measure for precision for their balances. This would help both the manufacturer and the user.

The Quartz Microgram Balance

The Ultra Microbalance, of which a beam assembly was exhibited at Nottingham, was discussed by Dr. C. L. Wilson (Queen's University of Belfast).

It has been shown that the limits of ordinary kinetics of reaction are at least as low as 10^{-16} to $^{-20}$ g. Consequently chemical operations in the range of 10^{-6} to 10^{-9} g. need take no account of any alteration in the type of reaction. Only proper manipulation and observation are required for the study of ordinary analyical reactions on this reduced scale.

This range has latterly become of considerable importance both in the chemistry of the trans-uranic elements and in many fields of applied analysis where hitherto only qualitative or semi-quantitative observations were possible.

The more important ultra-micro or microgram balances so far devised can be grouped in five broad categories; the displacement type introduced by Salvioni: the torsion-displacement type, of which the Nernst balance was an example: the beam and knife edge type employed by Steel and Grant: the helix type such as that of Bang: and the torsion-restoration type first introduced by Neher and recently improved by Nirk and his co-workers.

The last, which has a much more favourable relation of load to sensitivity than any of the others, seemed the best one on which to base the construction of a simple laboratory model.

Kirk's Balance

The balance of Kirk and co-workers employs an all-fused-quartz beam construction which has all the advantages of these systems for which they were first chosen by Steele and Grant. However, the necessity for fused joints in the extremely fine fibres renders the construction a very difficult operation requiring elaborate and expensive equipment.

In the balance in operation at Belfast this difficulty was overcome by the use of cemented joints. Such joints have not so far shown themselves to be the source of any serious decrease in efficiency.

Certain other minor modifications were made in the Kirk balance, and the thickness of the torsion fibre was decreased from 23 μ to 15 μ.

A sensitivity of 0.002 microgram per minute of arc is obtained, and a maximum load of at least 390 micrograms. It is not possible to read, with the present inferior optical system, to less than about 35 minutes of arc, and a standard deviation of 0.01 microgram is therefore the best value recorded.

The performance cannot be compared with that of the Kirk balance, since the various figures quoted by them cannot be evaluated properly, and, indeed, conflict within themselves. As far as can be judged, however the performance compares favourably, while the cost of such a balance is but a fraction of that at present marketed in the U.S.A.

A reasonably accurate quartz torsion-restoration ultramicro balance can therefore now be regarded as an instrument within the reach of the ordinary well-equipped microchemical laboratory.

MANUFACTURE OF VERY TOXIC CHEMICALS

*Plant Design and Operation**

by S. B. CORMACK, M.A., D.Sc., Ph.D., F.R.I.C.

CHLORINE is today a familiar and widely used chemical. It goes all over the world in cylinders and drums. It is carried about in many countries in road and rail tank wagons of capacities of seven tons, 14 tons, or higher.

Accidents are very rare. Yet in the early days of its use chlorine was transported and used in the form of bleaching powder because that was considered to be the only safe means of handling it; and it was a dreaded poison gas in the 1914-1918 war. [Again, that very powerful poison—hydrocyanic acid—or Prussic acid as it was popularly called, was only mentioned at one time when it or its salts were used by would-be suicides, yet its salts are now extensively employed in heat treatment baths, and the acid itself is a well known fumigant and a starting material for many commercial products, including for example, "Perspex."]

Hazards Overcome

Tetraethyl lead in its pure form is extremely poisonous, yet it is now manufactured with perfect safety in large quantities for admixture with other materials to give special fuels. Nor can we omit to mention the field of atomic energy, where a completely new world of hazards and problems is being faced and overcome.

This is a feature of modern chemical industry. It has found means of producing, in ever increasing measure, materials which at one time were considered impossible to make and to use in quantity, because of the hazards involved in handling them. The nature of the materials has not changed, but our understanding of them, and of ways to deal with them has so increased, that there is now no material which cannot be made and handled in safety provided—but always provided—that we know what precautions are required, and that we observe these precautions at all times.

Toxic materials may be described as those which act on the bodily mechanism in such a way as to cause interference with the normal functions and structure, leading to temporary or permanent disability and death.

Except for specialised purposes such as fumigants and pest control agents, we do not make chemicals because they are toxic. We make them for use as solvents, as refrigerants, as cleaning agents, as important intermediate compounds for chemical manufacture.

The importance of knowing the minimum lethal dose is accepted, but nowadays it is realised that from the point of view of industrial health, there is frequently a much more subtle effect due to long continued exposure to extremely low concentrations which appear, at first, to be so slight as to be negligible.

If we propose to manufacture toxic chemicals, we must be prepared to take precautions against materials which can cause immediate death in some concentrations and lead to serious and ultimately fatal disorders by exposure to lower concentrations.

These effective concentrations are frequently extremely small. A concentration of 50 p.p.m. HCN for a few minutes will cause serious injury or death. A concentration of 10 p.p.m. phosgene is fatal in a matter of minutes, and a concentration of one to two p.p.m. will produce serious lung effects after less than half an hour's exposure.

Delayed Effects

Mustard gas is a good example of delayed action. Nothing happens at the time. Again, in the case of phosgene there is an immediate effect of choking and coughing, from which the patient recovers and indeed, has a feeling of well being. But if allowed to return to normal duties he may well collapse and die some hours later when the lungs fill up with fluid as a secondary delayed effect. Undue exposure to nitrous gases gives a similar result.

The effect of these complications on the organisation and operation of the factories handling such materials can be appreciated. Workmen will face up to many risks with perfect equanimity when the result of a mistake is immediate retribution; they do not so readily settle down to a job where the consequences of an error may come many hours afterwards, when they are at home or in the pub with their mates. And the more imaginative and intelligent they are, the more do they feel the shadow of not being sure.

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* Abstracted from the paper presented before the North Western branch of the Institution of Chemical Engineers in Manchester on October 8.

If we are contemplating the manufacture of very toxic materials, we must therefore have in mind the extraordinarily low concentrations at which they can act, the very insidious effects of delayed action, and the wide range of maladies which they can produce.

We might add, in conclusion, the very varying susceptibility of different individuals which cannot be predicted. Just as it is often the big healthy, strong looking fellow who gets seasick while his thin, emaciated companion remains unmoved, so one workman may collapse in a concentration where others have worked maybe for years without any effect. Before attempting to build plants for the manufacture of toxic materials we must have the best medical advice we can get; we must be given some figures for toxic concentration, and we must plan accordingly. If we do not, we may find that a full scale plant has been erected and operated, when suddenly a succession of illnesses or maybe fatalities causes production to be stopped and a complete redesign of plant is required before manufacture can be restarted. And when it does restart, the plant has a bad reputation.

Distant Control

The problem of the manufacture of toxic materials, thus becomes one of isolating the plant so that the ingredients get no opportunity to affect the workers; of designing so that the operation can be controlled at a distance; of making arrangements so that maintenance is reduced to a minimum, and when it is necessary, of so conducting it that the hazards to those concerned are reduced to a minimum; of ensuring that all effluents are rendered innocuous before disposal, and of building up the organisation to do this; workers, supervisors, medical and safety arrangements. It is no more than that—but no less than that either.

[The author went on to describe, with illustrations, what is involved when a joint ring has to be replaced in a system carrying (a) water; (b) a normal chemical, such as sulphuric acid; and (c) a highly toxic low-volatile liquid such as mustard gas. The first might be carried out in about 30 minutes without risk; the second in about an hour with little risk if the normal precautions were observed; the third would require about three hours' work involving the most elaborate safeguards and full protective clothing and the collaboration of specialists to supervise both the work and the measures to safeguard those performing it.]

Such considerations are fundamental to the design and operation of these types of plant, and the designer and plant manager must get into their heads the realisation that the plant must be constructed so as to require the minimum of adjustment and repair, because even the simplest repair job will take an hour or more.

Avoiding High Pressures

In considering the design of the plant we should start first by looking at the process itself. All possible routes to the final product should be examined, and if we have any choice of process we should choose the one that avoids high pressures and fractional distillation, that gives the minimum of effluent, and that avoids filtration processes.

Particular attention should be paid to selecting a process in which the " toxic stage " is reduced to the minimum. For example, instead of purifying the final product by distillation it may be possible to achieve the same result by purifying some, or even all the non-toxic starting materials. Even although this may require, at first sight, more equipment and more labour, it will be additional work under non-toxic conditions and will, in the end, give an overall reduction in the man hours required to operate the process and maintain the equipment.

The normal layout involves enclosing the " toxic " section of the plant in cubicles and the plant items should be laid out, as far as possible, for transfer of toxic liquids by suction. Transfer of liquids by suction means that any leaks are into the plant and not out of it, and if a pipe should fracture, the flow stops, whereas if compressed air or pumping has been employed, the flow of liquid will continue until the motive power is shut off. Where pumps have to be used the submerged verticle spindle type is to be preferred, since the glands have to be sealed against vapour and not liquid. But don't expect to draw such a pump out of the toxic liquid every week for routine maintenance!

All the intermediate and final storage tanks must be fitted with some type of device to show how much material is in them at any time. It is important to know this, not only to measure efficiencies and observe the general flow and prevent overfilling, but because the quantities of toxic material must always be carefully checked. Any unaccounted loss means that some material has got out of the system, and until discovered it is more dangerous than a tiger escaped from a zoo.

It is advisable to have all the joints at the top of the vessel so that they will be in contact with vapour and not liquid. Bottom run off connections are generally to be avoided because it may mean having to repair a joint or a valve with a head of toxic liquid above it.

None of the valves inside the cubicle can be regularly operated by anyone going inside, so that either the pipe carrying the fluids has to be brought to the front of the cubicle and operated by a man just putting his hand inside, or distance controls must be used. Examples of both these methods will be seen on the lantern slides which we shall look at presently.

The layout of the pipe work under these conditions is entirely different from that normally followed, and the draughtsmen concerned must be very carefully trained and supervised in order to make sure that all the pipes are arranged to give suitable access to valves and to avoid "pockets" where toxic material will continue to lie when the pipes are drained. A method adopted successfully in some toxic plants is to install the plant items and then "run" the pipe connections on site.

As far as possible, electric motors should be kept out of the cubicle. Think what happens when toxic material gets spilled on them, or when they get saturated with toxic vapours which condense on the windings. Even totally enclosed flameproof type motors "breathe" and suck in vapours when they cool down after running.

(To be continued)

Chemistry of Plastics and High Polymers*

A book of this kind and calibre has long been needed. It is written chiefly from the standpoint of an organic chemist. The author, head of the department of chemistry in Birmingham Central Technical College, treats his large subject thoroughly, skilfully and lucidly. As an introduction to high polymers, the book can be recommended to students of B.Sc. standard and to post-graduate chemists in industrial or university laboratories.

Introductory chapters contain an account, mainly qualitative, of high polymer formation and structure. The succeeding portion, comprising about one-third of the book, gives a concise survey of all the main synthetic species, subdivided into addition polymers, the polyester, polyamide, and polyether group, phenoplastics, and aminoplastics. A further series of chapters, occupying a similar proportion of the book, describes naturally occurring polymers, particularly proteins, cellulose, and rubber, with briefer accounts of lignin and drying oils. Another chapter deals with inorganic polymeric substances, such as mineral silicates, glasses, and graphite; silicones are included. Finally, there is a brief account of physical properties in relation to structure, which incidentally serves to correlate some of the data of earlier chapters.

Arbitrary technological classification is rightly subordinated to chemical relationships and to considerations of the size, shape, and intermolecular attractions of polymer molecules. Thus, rubbers from butadiene and chloroprene are considered with polyvinyl plastics, while Thiokol rubbers and fibre-forming polyamides appear in the same chapter as alkyd resins and shellac. Few recent developments, up to 1948, are overlooked, e.g., a clear account of recent German work on the structure of phenol-formaldehyde plastics is given, redox polymerisation systems are described, and α-methylene activity in rubber and drying oils is discussed. Accurate references are made to some of the more important manufacturing processes and industrial applications in which the various polymers are concerned.

The writing and the printing of the book are both excellent. It contains few printer's errors and it is adequately indexed. A few factual errors were noted, e.g., Neoprene is wrongly classified as a British rubber (p. 64), emulsion stability appears to be confused with gelatin in solution (p. 34), and tetramethylthiuram disulphide is given a wrong formula (p. 185). Numerous condensed references (author and date) are incorporated in the text. These, together with book references at the end of each chapter, greatly enhance the value of the work for readers seeking more detailed information.—R. G. R. B.

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* CHEMISTRY OF PLASTICS AND HIGH POLYMERS. Patrick D. Ritchie, B.Sc., Ph.D., F.R.I.C. 1949. London: Cleaver-Hume Press, Ltd. New York: Interscience Publishers, Inc. Pp. 288. 25s. net.

POTENTIAL RIVAL OF DDT

Successful Results with Chlorinated Camphene

JOINING the ranks of new organic insecticides, such as DDT and the gamma isomer of benzene hexachloride and chlordane, is chlorinated camphene.

This compound, having the approximate empirical formula $C_{10}H_{12}Cl_8$, is made up of several isomers, all of which possess outstanding insecticidal properties. The commercial grade of chlorinated camphene is an amber, waxy solid possessing a mild, pleasant odour. It melts in the range of 70° to 95°C.

Many inexpensive commercial solvents, such as acetone, carbon tetrachloride, xylene, kerosene, deodorised kerosene and fuel oil, will dissolve chlorinated camphene, which is equally solube in aromatic and aliphatic hydrocarbons. The heat required to raise the temperature of this insecticide is 0.257 to 0.028 cal./gm./°C. over the temperature range 25° to 162°C. The density of chlorinated camphene decreases from 1.66 gm. per ml. at 27°C. to 1.57 gm. per ml. at 150°C.

This new insecticide possesses an acute oral toxicity, greater than DDT, benzene hexachloride or chlordane. The mean lethal dose of chlorinated camphene is 60 mg./kg. of body weight; comparable figures for DDT, gamma isomer of benzene hexachloride. and chlordane are 250 mg./kg., 125 mg./kg., and 500 mg./kg., respectively.

Toxicity

The sub-acute, or chronic toxicity of chlorinated camphene is lower than that of the other insecticides mentioned. Its killing power and effectiveness are due to the combined action of contact and stomach poison effects. Studies on the influence of chlorinated camphene on warm-blooded animals show that it is an effective stimulant of the central nervous system in the mouse, rat, guinea pig, dog, calf, goat and sheep. The lethal does causes generalised convulsions and death due to respiratory failure.

Chlorinated camphene, or its chlorinated metabolite, appears to be stored in fat tissues when given in sub-lethal doses and is only slowly excreted or otherwise removed from the body.

The material, which is also known as toxaphene, is non-injurious to a wide variety of plant species, but causes severe injury to squash, cucumber, melon and other cucurbits, particularly to young plants under conditions of high humidity. Experiments are proceeding to determine the effect of this insecticide on the soil, but preliminary work rather indicates that it is broken down in the soil by micro-organisms and rendered harmless within a short time.

The importance of insect control in cotton growing is now being more fully appreciated and, during recent years, publicity has been given to the losses suffered yearly due to the depredation of insects; this amounts to an average of about 15 per cent, or one bale out of seven.

Cotton Insects

So far, toxaphene has found its principal use in controlling the cotton plant insects. During 1948, the first year that it was commercially available on a large scale, more than 30 million lb. of toxaphene dusts and sprays were used by American farmers to combat cotton insects, grasshoppers, the army worm and other pests.

Many of the leading cotton-growing states of the U.S.A. are now using 10 lb of 20 per cent chlorinated camphene for each application per acre against the boll weevil, boll worm, cotton aphid, cotton leafworm and Southern green stink bug. For the cotton flea hopper, rapid plant bug, tarnished plant bug and thrips, 10 lb. of 10 per cent per application is recommended. Where the red spider is present, it is necessary to include at least 40 per cent conditioned dusting sulphur in a toxaphene formulation

Chlorinated camphene is also effective for controlling grasshoppers, when applied at the rate of 1.5 to 2 lb. per acre. When properly applied, the period of effectiveness ranges from 5 days to 2 weeks, depending on vegetation, climatic conditions, etc.

The insecticide contains from 67 to 69 per cent chlorine. Several methods have been standardised for the determination of total chlorine in toxaphene and its formulations. The chlorine is split out by treatment with metallic sodium and isopropyl alcohol, as in the U.S. Department of Agriculture's method for DDT, and titrated by the Volhard method using the nitrobenzene modification. Insecticide manufacturers in the U.S.A. report that this has been found to be the most convenient method for control work.

◆ PERSONAL ◆

THE Lord President of the Council has appointed Mr. A. H. Wilson, Mr. A. H. S. Hinchcliffe, Lord Halsbury and Prof. R. S. Edwards to be members of the Advisory Council for Scientific Research for five years from October 1. The new members succeed Mr. W. F. Lutyens, Mr. W. J. Drummond, Sir Henry Guy and Sir William Halcrow, who have retired on the completion of their appointments. Mr. A. H. Wilson combines university and industrial experience in science. In 1945 he became director of research and development of Courtaulds. Mr. A. H. S. Hincliffe, governing director of Glazebrook Steel and Co., cloth merchants and exporters of Manchester, has been chairman of the Manchester Joint Research Council and was largely responsible for its creation. He is a director of the Manchester Royal Exchange and a local director of Barclays Bank. Lord Halsbury is managing director of the National Research Development Council. Professor R. S. Edwards is an economist who has recently made a comprehensive study of research associations.

Lord Boyd-Orr, chancellor of Glasgow University, has been chosen from 23 candidates as winner of the Nobel Peace Prize for 1949. Lord Boyd-Orr stated that any money he received from the award would be devoted to the furtherance of his world food plan and to encouraging greater co-operation between nations for increasing the fertility of the land.

Mr. H. Collacott, who has been a member of the staff of The Evans Biological Institute since it was opened in 1902, has retired after 47 years' service. Also retiring is Mr. J. Hampson, who has been a chemists' representative for the company in the North for 28 years, and has served, in all, for 46 years. Mr. H. Fardon, who was manager of Charles Midgley, Ltd., a company in the Evans group, has also retired after 28 years' service.

Mr. William Wishnick, son of Mr. Robert I. Wishnick, president of the Witco Chemical Company, New York, and Mr. Harold A. Wilson, son of the late Mr. Harold Wilson, a well-known figure in the colour and chemical industry, have been appointed to the board of the Witco Chemical Co., Ltd., London.

Dr. R. A. V. Raff, specialist in high polymer research, has been appointed to a new fellowship on plastics established in the Mellon Institute by Koppers Company, Inc. Dr. Raff was previously in the employ of the Howard Smith Paper Mills, Ltd., Cornwall, Ontario.

These officers were elected at the recent annual meeting of the Atomic Scientists' Association: President, Prof. R. E. Peierls; executive vice-president, Dr. K. Lonsdale; hon. general secretary, Dr. C. Champion; hon. treasurer, Dr. F. C. Pickovance; editor of the Association's journal, Dr. J. L. Michiels; librarian, Dr. W. D. Allen.

Mr. P. Cattermull, whose retirement from the general managership of the Tudor Accumulator Co., Ltd., is announced, has spent 30 years with that company, as secretary, director and general manager, and from October 1943 until the present time as chairman. He will, at the invitation of the board, continue as chairman.

The Melchett Medal for 1949 for outstanding achievement in work involving scientific preparation or use of fuel was presented to Air Commodore Sir Frank Whittle last week at the annual dinner of the Institute of Fuel.

Mr. W. J. Intin, assistant manager of the Scottish Co-operative Wholesale Society's soap works at Grangemouth, has been co-opted to the Grangemouth Town Council. The Provost of the town, Mr. J. Penny, is manager of the soap works.

Kemball, Bishop & Co., Ltd., Crown Chemical Works, Bromley-by-Bow, London, E.3, announce that, owing to ill health, Mr. W. Cash has resigned from the board of the company, of which he has been a director for over 20 years. He was chairman from 1934-1948.

BSIRA Library

A catalogue of books in the library of the British Scientific Instrument Research Association has been compiled by Miss J. M. Fulford, until recently its librarian. The catalogue (62 pages), comprises a classified list in accordance with the Universal Decimal system, and alphabetical indexes of authors and subjects. It is complete up to March, 1949, and supplements will be issued at intervals in the *Bulletin* of the association.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

PROGRESS of one of the largest man-made fires, burning underground in the Gorgas mine, 55 miles northwest of Birmingham, Alabama, as part of the United States experiments in coal gasification, is being followed by means of an electronic mercury-vapour detector. The fire, is in the Alabama Power Company's Gorgas mine, where subterranean gasification experiments are being conducted by the U.S. Bureau of Mines and the Southern Research Institute. At regular intervals through the vein, small capsules of mercury have been placed in the path of the fire. The mercury-vapour detector records the gases emitted from the mine, as well as mercury vapour, the occurrence of which records progress of the fire along a seam. The mercury-vapour detector makes use of the fact that ultra-violet light is scattered when it passes through an atmosphere containing mercury vapour The detector is not affected by carbon monoxide and hydrocarbons.

* * *

At a meeting of the Minnesota section of the American Chemical Society. Dr. W. E. Lundquist, of the Minnesota Mining and Manufacturing Company, predicted an expanding market for plastics materials and said that the American plastics industry, which had a record production of almost 1500 mil. lb. last year, was doubling its output every three years. There was every reason to expect that production would continue to rise rapidly for some time in view of the fact that there were several relatively new fields in which plastics promised to become more and more a part of everyday existence. New synthetic fibres similar to nylon constituted one of the most important of those fields, and in the next few years one could expect to see others which would take over some of the clothing uses previously largely monopolised by wool. There was a tremendous market for textile materials, and many of the larger chemical companies were spending vast sums for the development of those new synthetic fibres. Of the new plastic materials, one of the most promising was polyethylene.

* * *

Utilising the combined research facilities of both companies to promote developments and new processes in the field of phenol and derivative chemical products, Reichhold Chemicals, Inc., of Detroit, Michigan, and the Diamond Alkali Company, of Cleveland, Ohio, have announced plans for a co-operative venture which will see the further development of Reichhold's phenol operations at present located at Tuscaloosa, Alabama. The plant involved in the deal, which uses the sulphonation process, was built by Reichhold in 1943 at a cost of $3.5 million in order to alleviate the wartime shortage of phenol. Under the new plan the physical assets and operation of the Tuscaloosa plant will be transferred to a new Alabama corporation. Diamond Alkali has entered into a financial arrangement with Reichhold which will provide funds for the extensive modification and improvement of the processes principally employed and has also acquired an option to purchase a half-interest in the new Alabama company.

* * *

Coincident with the statement that Lever Brothers Company will move its headquarters from Cambridge, Massachusetts, to New York City on December 1, 1949, to New York City for a $7 million expansion programme for the company's manufacturing operations. Simultaneously, the executive and general offices of Lever's three subsidiaries, Pepsodent Company and John F. Jelke Company, both of Chicago, and Harriet Hubbard Ayer, Inc., New York, will be moved into the new centralised offices in New York.

* * *

A new aluminium welding process, called Aircomatic, which is expected to have a marked effect upon the industrial and job welding of aluminium, has been developed by commercial interests and research at the Battelle Memorial Institute, Columbus, Ohio. The new process is claimed to join aluminium plates ⅛ in. to 3 in. or more in thickness. It is said to be at least four times faster than any previously known process of welding aluminium which produces welds of equal quality, to require less skill than present methods of fusion welding of aluminium, and to be adaptable to semi-automatic and machine operation. No solid fluxes are required, there are no slags to be cleaned from weld joints, and the welder's work is not interrupted to change electrodes.

• HOME •

National Certificates in Textiles

Since the inception, in 1935, by the Textile Institute and the Ministry of Education of the scheme for the award of national certificates in textiles, the highest number of certificates won in any one year is the outcome of the 1949 examinations. Of a total of 298 students who sat, 230 were successful.

Borax Prices Unchanged

Borax Consolidated, Ltd., announces that, notwithstanding the change in dollar value of sterling, its prices of borax and boric acid are unchanged. The normal demands of its regular customers will be supplied from stocks at prices ruling before devaluation. A further announcement will be made by the company before prices are increased.

U.K. Metal Prices Reduced

A reduction in the price of good soft pig lead by £6, from £111 to £105, a ton delivered, from October 19, was announced by the Ministry of Supply last week. This is the fourth cut since the price was advanced from £34 15s. to £122 on devaluation of sterling. The buying price for rough copper, in slabs of from 2 to 3 cwt. was reduced from £110 to £100 a ton.

Untaxed Fireworks

The Customs authorities, after having consulted with the British Pyrotechnists' Association, have decided that fireworks and fireworks composition generally shall be exempt from purchase tax. Exceptions are "joke bombs" and boxes of assorted indoor fireworks, both of which will be chargeable at 33⅓ per cent. The various categories are set out in the "List of Authorised Explosives" (HMSO, 3d. net).

End of Irish Refinery Scheme

The remaining portable buildings and equipment of the proposed Irish national oil refinery at the North Wall, Dublin, are to be sold. Thus will end the attempt started more than ten years ago to establish an oil refining plant for Ireland's needs and to build up an industry for the export of oil by-products. The scheme was to have been financed with Irish, British and American money. Two companies were formed in 1937 to refine oil and to export by-products. Adequate finance, however, was not made available and there was stated to have been trade union opposition.

Soap Substitutes Freed

Consequent upon the Government decision to remove control from soap substitutes packed for retail trade, the Soap Substitutes (Labelling and Prices) (Revocation) Order, 1949, will come into effect on November 6; this revokes Order No. 633, of 1943.

Better Paraffin

Shell-Mex and B.P., Ltd., announce that their first quality paraffin (White May) will again be on sale to the public on November 1. This step has been made possible by the lifting of Government restrictions, following repeated requests from users who require a fine quality paraffin.

Coal Production

Britain's total output of coal last week was 4,334,900 tons (4,072,600 tons deep-mined, 262,300 tons opencast), compared with 4,240,400 tons (3,993,100 tons deep-mined, 247,300 tons opencast) in the corresponding period last year. There was a slight decrease in production of 6400 tons compared with the previous week's total of 4,341,300 tons.

New Instruments Company

New groups have been formed to control the production operations, at Glasgow, Barkingside and Basingstoke, and the sales and servicing of a wide range of industrial instruments formerly associated with Kelvin, Bottomley and Baird, Ltd., and Henry Hughes & Son, Ltd. The latest organisation is Kelvin & Hughes (Industrial), Ltd., 2 Caxton Street, S.W.1, to sell and service the testing and recording instruments produced by the co-ordinating production company, Kelvin & Hughes, Ltd.

Noxious Gases Legislation

A request that carbon black and lamp black works be excluded from the proposed changes to the Alkali, etc., Works and Regulation Act, 1906, was one of the main features of the public inquiry held by Mr. W. A. Damon at Caxton House, London, on Tuesday last. Manufacturers of carbon black stated that it was being produced in this country by a secret process evolved in the U.S.A., and that it was feared the inspectors might require information which the English producers were prevented by their covenant from disclosing.

• OVERSEAS •

Indo-China Fertiliser Project

A local nitrogen and phosphate fertiliser industry is proposed in Indo-China as part of the ten-year plan established by the Government. Doubt has been expressed whether it will be possible to realise in 10 years all the projects proposed, bearing in mind the shortage of foreign currency.

Water Problems of U.S. Industries

A series of lectures on various water problems of the process industries is to be given on November 17 at the third annual autumn symposium of the New York section, American Institution of Chemical Engineers. Subjects to be discussed include substitution of air or seawater for surface water cooling towers, water treatment to reduce sealing, applications of compression distillation, and an overall surey of the economics of supplying water to the plant.

Priority to Polish Chemicals

The current Polish six-year plan proposes that production by the chemical industry shall be doubled in relation to present production figures. Twelve per cent of total capital investments are to be devoted to the chemical industry and mines, the major part to be used to reconstruct and develop plants in the ex-German region which will provide 30 per cent of total chemical production, including many products which were not made by Poland in 1939. The Moscisce nitrogen plant, which was seriously damaged, is now working at reduced capacity; in 1950 the Auschwitz plant will be under full production.

Canadian Coal Tar Products

Output from the coal tar distillation industry in Canada during 1948—the Bureau of Statistics reports—was valued at $8,077,247, 27 per cent more than in 1947. Production of creosote oils in 1948 totalled 11,044,351 gal. worth $2,678,993; refined tars amounted to 2,443,658 gal. ($416,869) and pitch totalled 87,614 tons ($2,511,114). Phenol, cresols, xylenols, phthalic anhydride, tarred felts, coal tar paints, pitch coke, tar and asphalt cements, disinfectants, and asphalt saturants were other principal products. Eleven plants were operated in 1948, one in Nova Scotia. two in Quebec, five in Ontario, two in Manitoba and one in British Columbia.

Belgian Chemical Export Rates

Chemical exports from Belgium, which before the war amounted to 6 per cent of total exports and were valued at about Fr. 2 milliard annually, reached 10.5 per cent of total exports in 1947 and 8.7 per cent in 1948. Current plans for the manufacture of oil by-products are likely eventually to improve the chemical export rates.

Indian Vegetable Oils

The export of Indian oil seeds and vegetable oils in the first half of 1949 showed a decrease compared with the corresponding period of last year. Groundnut kernals were reduced from 50,000 to 38,000 tons: groundnut oil from 30,000 tons to 16,000 tons; linseed from 23,000 tons to 22,000 tons; linseed oil from 5000 tons to 3000 tons; castor oil from 13,000 tons to 1000 tons.

Australian Technicians go Overseas

Broken Hill Pty., Ltd., Australia's great iron and steel organisation, is sending four of its executives overseas to study the latest developments in metallurgy and engineering. A lead expert will go to Monterey, Mexico, where a lead refinery has asked for technical assistance with continuous refining processes which Broken Hill Pty., Ltd., carries out at Port Pirie, South Australia. Other staff members will visit the U.S.A.

Increasing Sweden's Aluminium Output

An agreement has been entered into between A. B. Svenska Metallverken, Vasteras and Aluminium, Ltd., Montreal, by which the Swedish firm will take over the Canadian company's interest in Svenska Aluminium-Kompaniet, A.B., nominally worth 1.75 million Swedish crowns. An expansion scheme enlarging the Svenska Metallverken company's rolling mill, is expected to result in doubling Sweden's present aluminium production.

Australian Oil Development

The modern installations at the Vacuum Oil Company's new refinery at Altona, Victoria, Australia, include 20 miles of pipelines to carry steam, air and crude oil. The refinery will use 1200 gal. of salt-water per minute for cooling. The storage tanks have a capacity of 6 million gal. of crude oil. and provision has been made for possible enlargement of the refinery if oil is struck in New Guinea. where the Vacuum Company is engaged in exploration work.

Next Week's Events

MONDAY, OCTOBER 24

Society of Chemical Industry

London: Horseshoe Hotel, Tottenham Court Road, W., 6 p.m. (Food Group, joint meeting with the London section of the Institute of Brewing). Prof. H. Lundin (Stockholm): "The Microbial Synthesis of Fats."

Leeds: University, 7 p.m. (Yorkshire section). D. Tabor: "Some Recent Experiments on the Friction of Solids."

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. J. H. Carrington: "A Talk on Rubber Compounding."

TUESDAY, OCTOBER 25

Society of Chemical Industry

Leeds: University, 6.30 p.m. (Joint meeting with the RIC and Leeds University Chemical Society). H. Baines: "The Chemist in the Photographic Industry;" and scientific films.

SCI Chemical Engineering Group

London: Geological Society, Burlington House, Piccadilly, W.1., 5.30 p.m. H. W. Thorp: "Chemical Engineering Problems in the Sea-Water Magnesia Process."

British Road Tar Association

London: May Fair Hotel, Berkeley Street, W.1, 2.30 p.m. Annual general meeting, followed by annual dinner.

Institute of Welding

London: 11 Upper Belgrave Street, S.W.1, 6.30 p.m. O. V. S. Bulleid Presidential address at opening of Autumn meeting (3 days).

WEDNESDAY, OCTOBER 26

Society of Chemical Industry

London: The Chemical Society, Burlington House, Piccadilly, W.1, 6.15 p m. (Joint meeting of the Nutrition Panel and Agricultural Group). Dr. J. Hammond: "Genetic Factors Affecting the Nutritional Value of Animal Products;" R. H. Richens: "Genetic Factors Affecting the Nutritional Value of Crops."

Society of Instrument Technology

London: Manson House, 26 Portland Place, W.1, 6.30 p.m. F. Twyman: "Reflections on Fifty Years in the Optical Instrument Industry."

Manchester Literary and Philosophical Society (Chemical Section)

Manchester: Portico Library, Mosley Street, 5.45 p.m. J. F. Straatman: "Some British Raw Material for Chemical Industry."

Manchester Metallurgical Society

Manchester: Engineers' Club: Albert Square, 6.30 p.m. D. Binnie (president): "Problems Raised from the Study of Steel Ingots."

THURSDAY, OCTOBER 27

The Chemical Society

Liverpool: University, 4.30 p.m. Dr. R. S. Cahn: "Editing for the Chemical Society."

St. Andrews: University, 5 p.m. Dr. J. S. Anderson: "The Chemistry of Metallic Oxides."

South Wales: Cardiff University College, 7 p.m. Prof. C. K. Ingold: "Aromatic Nitration."

Chemical Engineering Society of University of Leeds

Leeds: University, 5 p.m. Members of the Institution of Chemical Engineers invited. Dr. Wild (AERE, Harwell): "Some Scientific Problems Connected with Nuclear Energy."

The Royal Institute of Chemistry

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Chairman's address. Dr. G. N. Burkhardt: "Some Amine-Aldehyde Condensates."

FRIDAY, OCTOBER 28

The Chemical Society

Glasgow: University, 3.30 p.m. Dr. M. P. Applebey: "The Art of Making Sulphate of Ammonia."

South Wales: Swansea, University College, 5.30 p.m. (Joint meeting with the RIC and University College of Swansea Students' Chemical Society). Prof. C. K. Ingold: "Aromatic Nitration."

SCI Chemical Engineering Group

Felstead, Essex: Works visit to beet sugar factory.

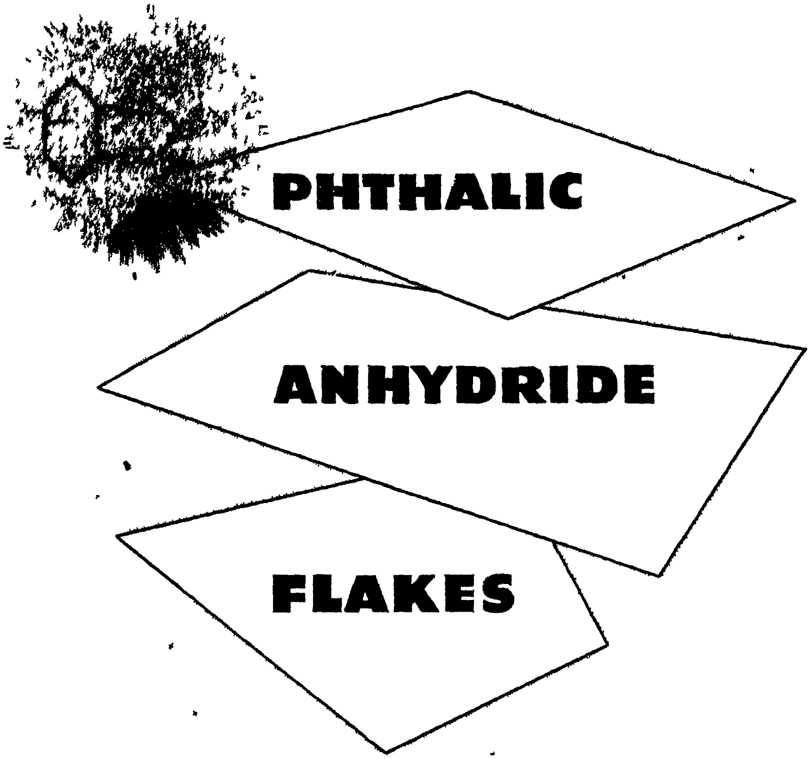
Electrodepositors' Technical Society

Sheffield: Grand Hotel, 6.30 p.m. (Sheffield and North-East Centre). A. W. Wallbank (new president): "The Relation Between the Laboratory and the Plating Shop."

SATURDAY, OCTOBER 29

Society of Leather Trades' Chemists

Manchester: Engineers' Club, Albert Square, 2 p.m. W. Cullen: "The Engineer, Engineering and the Tannery." Dr. F. P. Stowell: "Lime."



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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summar ,but such total may have been reduced.)

BRITISH PLASTOIDS CO., LTD., Nottingham. (M., 22/10/49.) Plastic manufacturers, etc. Sept. 19, £500 debenture and £500 further charge, to C. R. B. Eddowes, Derby; respectively a general charge and charged on "Southfields," Barrow-on-Soar. *£3150. August 14, 1947.

MANCHESTER OIL REFINERY, LTD. (formerly REFINERY (HOLDINGS) LTD.), London, W. (M., 22/10/49.) September 16, deed supplemental to a Trust Deed dated April 4, 1949; charged on certain lands and buildings, etc., at Barton-upon-Irewell. *£650,000. June 28, 1949.

Satisfactions

CABLES AND PLASTICS, LTD., Leeds. (M.S., 22/10/49.) Satisfaction September 26, of debenture registered December 30, 1947, and further charge registered November 19, 1948 (both fully).

PAL CHEMICALS LTD., London, N.W. (M.S., 22/10/49.) Satisfaction September 29, of a mortgage registered January 6, 1949 (receiver 79-81 Scrubs Lane, N.W.).

Increases of Capital

The following increases in capital have been announced: THE ALMEX RECOVERY AND REFINING CO., LTD., authorised share capital, from £30,000 to £50,000; issued share capital, from £20,000 to £40,000.

Change of Address

INDUSTRIAL & MARINE PROTECTIVE APPLICATIONS, LTD., has removed from Bolton to Fountain Street, Barnbrook, Bury, Lancs.

New Registrations

A. B. Fleming & Company, Ltd.

Private company. (27,282). Capital £300,000. Manufacturers of dry colours, dyestuffs and chemicals, etc. Directors: A. A. Gray, E. W. Muirsmith, R. W. Gillan and H. Newton, Reg. office: Caroline Park, Edinburgh.

J. C. Hewitt Products, Ltd.

Private company. (473,290). Capital £100. Objects: To carry on the business of manufacturers of disinfectants, insecticides, vermin destroyers, etc. Directors: J. C. Hewitt and G. W. A. Steel. Reg. office: 4 Westbury Avenue, N.22.

Magnus Chemical Company, Ltd.

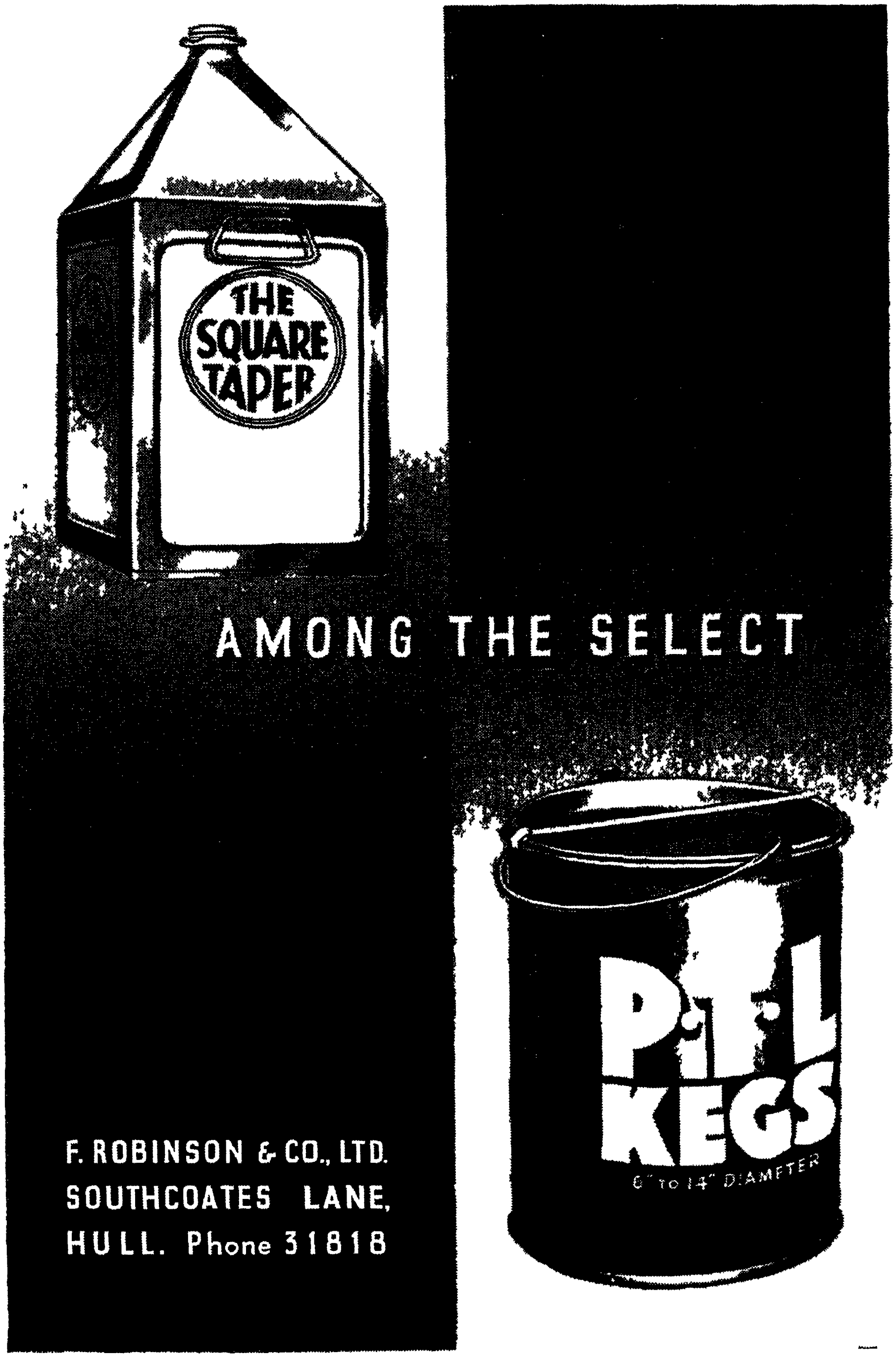
Private company. (473,290). Capital £2000. Manufacturers, refiners of chemicals, metals, metal alloys, salts and minerals, etc. Director: G. W. Wood. Reg. office: 39 New Broad Street, E.C.2.

Visual Efficiency, Ltd.

Private company. (473,641). Capital £1000. Manufacturers of soap preparations, chemicals, gases, drugs, etc. Reg. office: 9 Arundel Street, W.C.2.

Scot's Advice to DSIR

AT a building research conference, arranged by the Department of Scientific and Industrial Research, held at Glasgow last week, speakers complained that research was not always conducted on practical lines. Mr. I. A. Moodie, county architect, Perth, said that while the department had given him details of the life-cycle of the wood-boring beetle it had left it to private enterprise to produce the insecticide which would destroy the pest. "They kindly gave me the name of the fumigation concern who could tackle this large-scale job. Unfortunately, it was an English firm, and when they discovered the type of wall construction used in Scotland they were completely at a loss. I suggest the research station should take the subject further and themselves follow up this matter of dealing with the pest."



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The Stock and Chemical Markets

INDUSTRIAL shares and British Funds were subject to selling and moved lower in price pending the Government statement on the crisis measures necessitated by devaluation of sterling and the danger of inflation. Although an increase in the Bank rate is not expected in the City at present, the view appears to be growing that it seems inevitable next year.

The general effect of latest developments means that it will apparently be difficult for many companies confined to the home market to maintain profits and dividends. Consequently, so far as industrial shares are concerned, buying has again centred on shares of companies prominent in the export drive.

It is realised, of course, that dividend limitation prevents shareholders from having a larger payment and that limitation will remain in force so long as there is no change of Government.

As was to be expected, shares of chemical and kindred companies moved closely with the prevailing trend in industrial securities and were generally lower on balance, although in most cases the decrease was not more than a few pence. Imperial Chemical were back to 43s. 1½d., but Monsanto Chemical at 51s. 3d. have been steady. Elsewhere, Turner & Newall receded to 76s. 9d., and United Molasses to 40s. 9d., while the units of the Distillers Co. were 27s.

In other directions, Albright & Wilson were 30s., Boake Roberts 28s. 9d., and Brotherton 10s. shares steady at 20s. Amber Chemical 2s. shares were 5s. 3d., F. W. Berk 13s., and Bowman Chemical 6s. 9d. Pest Control 5s. shares were quoted at 8s. 4½d.

Among preference shares, L. B. Holliday 4½ per cents were 20s. 3d., W. J. Bush 5 per cents 23s., and British Chemicals and Biologicals 4 per cents 18s. 9d. Elsewhere, British Aluminium ordinary have eased to 42s. 3d., but Borax Consolidated showed firmness at 58s. 9d. British Glues and Chemicals 4s. shares remained steady at 19s., although Lever and Unilever eased to 42s. 9d.

Glaxo Laboratories were influenced by the share bonus, and at £29 were again higher on balance. British Drug Houses 5s. shares were well maintained at 7s., but in other directions, Triplex Glass at 10s. moved lower despite the good impression created by the full results. Business around 23s. was again recorded in General Refractories.

Shares of companies associated with plastics were dull generally with British Xylonite back to 72s. 6d., De La Rue 22s. 6d., Kleemann 9s. 9d., and British Industrial Plastics 2s. shares 4s. 9d. Despite the bonus, Metal Traders shares came back to 52s. 6d., but Amalgamated Metal have been steady at 18s. 6d. Dunlop Rubber at 61s. 6d. were lower with other leading industrial shares.

Iron and steels continued to show small irregular movements as the threat of nationalisation has been deferred by the announcement that the General Election would not be held this year. United Steel at 26s. 3d. eased on the past year's lower profits, although the unchanged 8 per cent dividend remains covered by a substantial margin. Dorman Long were 29s. 6d., Guest Keen eased to 39s. 6d., Stewarts and Lloyds to 53s. 6d. and Firth Brown to 68s. 9d.

Boots Drug came back to 49s. 9d., Beechams deferred to 13s. 3d., and Griffiths Hughes to 19s. 1½d. Ilford 5s. shares changed hands around 22s. 9d. British Celanese eased to 16s. 6d. despite the higher profits and good impression created by the financial results.

Oil shares lost some ground, Anglo-Iranian being £7⅛, Shell 66s. 10½d. and Trinidad Leaseholds 25s.

Market Reports

THERE has been little change in the position on the industrial chemicals market and the movement remains steady with delivery specifications covering good quantities. New home business has been on a good scale although buyers in some instances are disposed to limit transactions to spot or nearby needs. The volume of overseas inquiry is well up to recent levels. The majority of the soda products are in active request and the potash chemicals continue firm. A good call is also reported for barium compounds, formaldehyde and bleaching powder. Price fluctuations due to changes in non-ferrous metal values have been experienced in the last few weeks and new rates have again been announced for red lead and white lead. The basis prices for the former now being £128 10s. per ton and for the latter £136 10s. per ton. Unchanged conditions characterise the position on the coal tar products market and home market quotations remain unaltered.

MANCHESTER.—A satisfactory feature of

the Manchester market for both light and heavy chemical products during the past week has been the continued demand from the home using industries. Existing contracts are being steadily drawn against a fair weight of new business in the alkalis and a wide range of other products has been placed. On export account the demand seems to have been fairly well maintained, and new inquiries from the Empire and other leading outlets have been fairly numerous. In the market for fertiliser materials, basic slag, superphosphates and the compounds seem to be the most active sections.

GLASGOW.—Prices in the Scottish chemical market continue to be unsteady and a number of increases having been noted. There have also been a few decreases, particularly in lead compounds. There has been a very heavy demand for formaldehyde, which suppliers have so far been able to meet. The demand for paraformaldehyde has also shown an increase. Sales of whiting continue to increase in Scotland due mainly to the opening of factories depending on these supplies. In the export market there has been considerable activity in negotiations with dollar markets but some weeks may elapse before a definite indication can be given of the improved competitiveness of our chemical products at new rates.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

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The appointment would carry substantial allowances and would be at a salary commensurate with general acceptability; the service is pensionable. Write, quoting **No. 396, to Box 3086 c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

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CHEMICAL MANUFACTURING COMPANY in the North-West have a vacancy in their Development Department for an experienced **CHEMICAL ENGINEER.** Applications are invited from persons who possess A.M.I.Chem.E. qualifications or equivalent. For the successful applicant the position is permanent and pensionable. Write, giving full particulars, to **Box No. 2852, The Chemical Age, 154, Fleet Street, London, E.C.4.**

ESTABLISHED Export and Merchant business requires experienced **PURCHASING MANAGER** for new department handling chemicals produced in U.K. and elsewhere. Salary £750–£1,200 p.a. Write, stating age, education, qualifications, and experience, c/o **Company's Auditors, Messrs. Binder Hamlyn & Co., River Plate House, South Place, London, E.C.2,** marking envelope **"Chemical Buyer."**

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Volume LXI 29 October 1949 Number 1581

Oils and Fats

LITTLE is heard just now about a subject which, less than a year ago, loomed so large that even the general public gained an uneasy inkling that all was not well. That, briefly, was the shortage in most parts of the world of natural oils and fats, notably the vegetable ones, and the inadequacy of nearly all the schemes for satisfying that growing hunger. A year has gone since the chairman of Lever Brothers, Ltd., awakened some sleeping dogs by his clear-sighted picture of what are the world's minimum needs of vegetable oils, principally for food and for soap, and how poor are the prospects of their being fully supplied in the foreseeable future. The portents are almost all to the contrary, and whatever hopes may first have been raised by the African groundnut schemes are now, for the time being at least, completely deflated. There will be no useful increment of nuts or of oil from Kongwa or the other African territories this year or next, and although there are favoured areas around the world where nuts and oilseeds are as abundant as ever, those vital crops come more and more reluctantly to the oil mills and refineries in Britain and the other countries which have traditionally left it to others to raise the crops.

The groundnuts scheme, whose dismal early results—magnified by contrast with the callow optimism of some of its Parliamentary sponsors—do not encourage a fair estimation of what it may ultimately confer, and the determined and widespread efforts made to win from the sea acceptable substitute oils for food and industry, such as herring oil, both recognise how little reliance can be placed on the odd sources of oils and fats to replace what is now absent from the normal consumption schedules. The shortfall is succinctly expressed in the round figures of Western Europe's imports of oils and fats last year. The total is considered to have been 2,296,000 tons, which is almost exactly 100,000 tons better than the total intake in 1947 and yet represents only 63.5 per cent of what those countries were accustomed to receive before the war. That record tells almost the whole story, since Russia is as usual not a party to such international accounting; world exports in 1948 were only 2,933,000 tons, so that Europe took nearly all that was made available for shipment. By the end of this year 200,000 tons more may have come into the world markets and there may have been another 270,000 tons by the end of 1950.

Those are the estimates given in

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Brussels this year to the International Association of Seedcrushers by its secretary, M. J. C. A. Faure (*Oléagineux*, October 1949, 567-570). That expert thinks the best hopes of increase are to be found in Africa, North America, Indonesia, Malaya, and possibly the Philippines. It seems that the vast possibilities in South America, notably in Brazil and the Argentine, are very far from being realised, even partially, in the near future. Although considerable stocks have accumulated in the Argentine, the prospect that any large increase in the agricultural products will come from there is rendered remote by the two keynotes of that country's economic policy—the determination to sell processed goods rather than raw materials, and a passionate desire to get the highest prices that scarcity will permit.

While Argentina seems to have outstripped all others in extorting whatever the needy can be made to pay, no large producer of vegetable oils is likely, while present conditions prevail to accept complacently the relatively easy terms on which United Kingdom contracts were based in the past. Ceylon's Minister of Commerce, lately returned from discussions in London with Britain's Minister of Food, has observed that sellers' prospects are good for some years hence for copra and coconut oil, for which this country's contract expires this year. The U.K. delegation which is to seek to establish another long-term contract in Ceylon next month will have to take into account Ceylon's intention that prices shall be sufficiently ample to rehabilitate her coconut plantations. That policy may in the end be as important a factor as any designed to improve world nutrition, but it is likely that the first to benefit will be required to supply a large portion of the cost.

The scale of post-war price increases may be gauged by reference to one item above, coconuts, of which some 600,000 were to be shipped to the United Kingdom this month from Colombo. Fresh coconuts were being exported in 1945 for Rs.60 per 1000. In 1947 they realised Rs.150; today Rs.121 per 1000 is being paid.

The sympathetic movement which has been exhibited by all is no transitory affair or one likely to be halted so long as the needs of populations and of industries continue to expand very much faster than the means of supplying them.

Notes and Comments

Trade Before Devaluation

A NARROWING of the flow of export and import chemicals is shown to have occurred in September in most of the larger components of international exchange. The total effect on the export account was to reduce to £6,991,535 the receipts for all the chemical groups, which in September a year ago brought in over £7,519,000. Characteristic of outgoing and incoming totals was the reduction of dollar transactions, most conspicuous in the U.K.-U.S.A. accounts. Sales to the U.S.A. of all chemicals within the Board of Trade classification realised in September £134,366, against £230,829 at the same time last year, and even more substantial was the cut in our American chemical imports from £819,320 in September 1948 to £418,698. It is fairly evident that no kind of stockpiling was resorted to here in the weeks immediately before the "revaluation" transformed the relative values of British and American chemical products. The current export tables tacitly point a lesson to which little attention is generally paid in public pronouncements on export trade objectives. That is the steady and substantial trade (in chemicals) being maintained with the Scandinavian countries, the Netherlands and Pakistan and India, notwithstanding India's premature hopes of replacing with home production the industrial products of the West. Argentina and Brazil continue to be substantial buyers of British chemicals, a custom which the new currency relationship should not weaken.

Fuel Oil and Steel

RISING fuel oil prices in the shipping industry has been noted with concern by industries in Scotland which switched to oil. There has, fortunately, long been an increasing reluctance to venture on such conversions, the bulk of which were carried out soon after the war under the impetus of Government encouragement. Such firms may now face a serious increase in power costs, since most have in recent months been merely holding parity with others using conventional fuels. It is regarded now as certain that prices for industrial fuel oil must rise, probably to the same extent as marine oils. The steel industry in the West of Scotland converted to oil at very considerable cost and will now be caught in any upward trend. Colvilles, Ltd., uses fuel oil at its Motherwell and Clydebridge melting furnaces. This conversion was stated at the time to cost £1 million and adverse comment followed when the Government abandoned its earlier encouragement of the conversion policy. This present situation again emphasises an unwelcome effect of Government policy on industry and contains a definite threat of increased steel prices. Increased prices for the output of steel-using industries is regarded as inevitable if steel is advanced in price. Any such result would be particularly unwelcome at a time when effort is being directed towards a lowering of all selling prices.

"Token" Retrenchment

THE Prime Minister's accusation in his statement on Monday that the nation was not going "flat out" to gain economic recovery might well have been directed at the Government itself. It is not going flat out either. One fact that emerged clearly from the sketchy outline of the Government's plan to make economies of £250 million—more than half of it to be gained, gradually, at the expense of capital expenditure—was the failure to grasp the nettle. The moment when drastic measures might have been accepted with equanimity was lost, and the exhortations to produce more may well fail entirely to drive home the urgency and the gravity of the present position. There are to be cuts in capital expenditure to secure "a substantial total contribution" from the development of the fuel and power industries—the vital supply industries to manufacturers in every producing field There is to be a £35 million cut in the housing programme and tighter control of building. Estimates of the Government departments will be pruned, not "axed," and nowhere is there a bold, sharp incision of the major operation which is so clearly necessary. The saving of £2 million on the Ministry of Food is indicative of the timid character of this approach to the vital problem of cutting our coat according to our cloth. The last economy is to be derived mainly by reorganisation and dropping some "refinements of control." The fact has again been evaded that most of the controls themselves should go and with them the wasteful and costly bulk buying machinery, which every day adds to the national burden and frustrates initiative and enterprise in industry.

Nuclear Physics for All

THE realisation by the sponsors of a commercial enterprise that some knowledge of the scientific background and of the future of atomic energy is a legitimate concern of "the man in the street"—in this instance, the man and woman in the cinema—shows enterprise and vision. "Atomic Physics" is not exactly a new film; it has been shown to specialist audiences and has received an award at the Venice festival. Gaumont British Instructional, Ltd., which is the maker of the film, last week exhibited it at a West End cinema, where it continued its run this week. Marked interest has been shown by the general public which, in quite surprisingly large numbers, has paid to see an 85-minute film, the argument of which is by no means easy for the lay mind to grasp. "Atomic Physics" is the only film to date which has seriously tackled the problem of telling ordinary people something of the principles of that dramatic excursion in physics which may possibly intimately affect their future. The good work of the commentator, assisted by excellent animated diagrams, is largely responsible for the success of a film, which, though endowed with little entertainment value in the cinematic scale of values, is the very reverse of dull. Other producers of scientific films might do well to note the value of GBI's achievement and ask themselves if something of the same kind on their part would be of credit to their industry.

RUSSIAN TRANSLATIONS

SINCE September 1947, the use of Western European languages in periodicals has ceased in Russia. Prior to that time the lists of contents in many periodicals were translated into English, French and German, while some of the periodicals, such as *The Journal of Physics,* were published entirely in Western European languages.

DSIR Scheme

In attempts to make known the contents of Russian periodicals, many organisations have been translating contents lists for their own internal use. Recently the Department of Scientific and Industrial Research started a scheme for collecting these lists and publishing them at monthly intervals under the title of "Translated Contents of Russian Periodicals." The first issue appeared in June 1949. The original typescripts received from co-operators are used to make rota-print plates photographically.

Agriculture Medicine

About 100 Russian scientific and technical periodicals are available for export to this country and the DSIR publication covers some 70 of these in all fields, including agriculture and medicine. Copies of the "Translated Contents Lists of Russian Periodicals" are circulated free of charge to all co-operating organisations and, as far as the supply will permit, to other research organisations. If the demand becomes much greater it may be necessary to charge for copies.

A list of the periodicals not at present covered by the scheme is available and anyone interested in helping to make this publication complete is invited to write to the secretary, DSIR (Intelligence 1), Dorland House, 14-16, Regent Street, London, S.W.1.

RESISTANCE TO ALKALI WORKS ORDER

Carbon Black Makers Foresee Difficulties

FORCIBLE opposition was expressed, at a public inquiry in London last week, to official proposals to extend some of the provisions of the Alkali, etc., Works Orders. Resistance to the draft orders which the Minister of Health proposes to make under the Public Health (Smoke Abatement) Act, 1926, came principally from lamp black interests and a representative of one of the new carbon black undertakings, both of whom complained that there had been no adequate prior consultation and there were serious objections to making public the particular processes employed in the black plants.

Mr. W. A. Damon (Chief Alkali Inspector) held the inquiry, at the Ministry of Health on October 18, into the proposed extension of the effect of the Act and Orders to comprise, under " Sulphuric Acid Works," processes using oxides of nitrogen; under " Chemical Manure Works " granulating processes; under " Bisulphite Works " the evolution of oxides of sulphur in any chemical process; and under " Cement Production Works " the packing of cement and the grinding of cement clinker.

On the proposal to place " Fluorine Works " within the scope of the Alkali, etc., Works Regulation Act, Mr. Damon said the Act would cover the manufacture or use of fluorine compounds, which seemed fairly likely to be widely used in the near future. Replying to Dr. R. Lessing, he confirmed that the emission of traces of fluorine from registered cement works or fertiliser works would be within the new scope.

Exclusion of Black Works

Discussion centred principally upon the proposal to extend the effect of the Act to " Black Production Works " (the manufacture of carbonaceous blacks by the cracking or incomplete combustion of hydrocarbons, coal tar, petroleum or their derivatives).

Colonel R. H. Studholme (director of Philblack, Ltd.), asked that the black production works should be excluded from the proposed extensions. Pointing to the fact that the Minister could extend the Act, but not restrict it, he asked if that meant that any extension must remain for all time Mr. Damon said he believed that was so.

Another point he raised was that Section 4 of the Public Health (Smoke Abatement) Act, 1926, provided that the Minister could make an order only after consultation with the local authorities and interests concerned. The manufacturers of carbon black in this country were only just getting down to work and had no trade association. His firm, probably the biggest of all, had not been consulted. He questioned whether the order could be made without previous consultation with the manufacturers concerned.

No Representation

Mr. Damon agreed that they had no association and that there was no means of contacting the manufacturers as a whole. But the Ministry, he said, had contacted the Association of British Chemical Manufacturers and the Federation of British Industries, and had had some communication with the South Western Gas Board and with one of the companies. Some of the people concerned, at all events, had been consulted.

Colonel Studholme asked that before any final decision was taken, there should be consultation with his company. He submitted that the paragraph in the draft order which would extend the Alkali Act to black production works should be deleted, or that it should be limited to lamp black works as distinct from carbon black.

His company, he said, had been licensed by a well-established company in America to make here a particular type of carbon black by a secret process evolved in America. The company was in the midst of constructing its works here. The works would cost approximately £1 million, and would be used purely for making carbon black by that process. A good deal of that particular black was used in this country and the whole of that was imported from the United States.

A covenant had been signed to provide that the process should be kept secret, and if particulars were disclosed, the licensors could terminate the licence. If the proposal in the draft order became law, the inspectors might require information which the company had undertaken should be secret.

The company here had asked in the U.S.A. about the effect of the process on the health of the workers, and, rather to its surprise, was told that the American company, having watched the matter over a considerable number of years, could find no trace of danger to health. The workers there, continuously in the atmosphere of carbon black, used one cake of soap per man per day, and were allowed half-an-hour's washing time when they stopped work. It was material from the public health point of view that even under those conditions there had been no injury to health.

Full Safeguards

At the English works, an extremely expensive and complicated plant had been designed to filter the off gases and prevent black being discharged into the atmosphere. There were other precautions to keep wind out of the packing sheds, and to make everything leak-proof. They were advised that it would not be possible to redesign the filtering plant if new requirements were placed upon the company with the aim of preventing nuisance

They were also told that the present arrangements would meet the existing liabilities; they would meet the covenant of the landlords (the Bristol Corporation) against committing nuisance. Again, it was provided by the Public Health (Smoke Abatement) Act, 1926, that, even if the works were not covered by the Alkali Act, the Minister of Health could send an alkali inspector and could take action on his report.

The position at the moment was that the design of the plant was finalised, much of the material had been built to that design and the company was prepared to meet its obligations to the local authority and under the Public Health and Alkali Acts. He asked that the Minister should accept those obligations as being sufficient. He was not objecting to registration *per se*, but he was opposed to provisions which would enable an inspector to require the company to make known what it had promised not to disclose.

The make up of the oft gases from the process was as follows:—

Carbon dioxide	3	per cent by volume
Carbon monoxide	8	,, ,,
Hydrogen	9	,, ,,
Nitrogen	43	,, ,,
Water vapour	37	,, ,,
Carbon black	Trace	

He submitted that there was nothing in those off gases which could be injurious to health, except carbon monoxide, and that would not be injurious when discharged from the top of a chimney in small concentrations. Asked by Mr. Damon whether he could define " a slight trace " of carbon black, he said it was not expected to exceed .01 gr. per cu. ft. and it might be substantially less.

Commenting on the circumstance that once an extension of the Act was made it could not be unmade, Colonel Studholme submitted very strongly that until there was evidence of the need for bringing that new industry under the Alkali Act, the Minister should be asked to hold his hand, he would be taking an irrevocable step.

He gathered that it was desired to apply the Act to lamp black and in that connection he asked that complaints against one type of production should not be used as a reason to put another type permanently in the order.

Mr. McKay (representing Wood & Fairweather, which has been manufacturing carbon black and lamp black for 150 years), also made the point that the local authority concerned in his case had had no notice of the inquiry and had not been consulted. If the inquiry were conducted according to the strict letter of the law, the local authorities could say that they must be consulted. His firm's process, he observed, was also secret and they did not wish it to be divulged.

Speaking of the health of the workers, he referred to a list relating to employees who had been working for the company for long periods; four had been working there for more than 40 years, two for more than 30 years, and so on. The work had not affected their health.

Gasworks Problem

Mr. Palmer, for the North Thames Gas Board, submitted that the production of retort carbon within the retort in gas manufacture came within the definition of " works in which carbonaceous blacks are manufactured," although he assumed it was not the intention.

Mr. Damon could not confirm that that was so; he said that point was being considered.

At the conclusion of the inquiry, Mr. Damon said the observations concerning black production works would be conveyed to the Minister and there would be consultations with the carbon black and lamp black manufacturers.

Safety Measures in Factories

A Scottish conference on industrial accidents is to be held in Edinburgh on December 8, under the chairmanship of Sir Andrew Murray, the Lord Provost. The programme of the conference will cover the three main ways of averting accidents—guarding machinery, efficient safety organisation, and propaganda

SEPTEMBER'S CHEMICAL EXPORTS

Slightly Less Than in 1948

ALTHOUGH British chemical exports were lower in September than in the same month last year, they represented a slight increase over the August figures.

The total value of exports for the month shown in the *Trade and Navigation Accounts of the United Kingdom* for September 1949, was £6.994,535 (£7,519,213), made up as follows: chemical manufactures and products (other than drugs and medicines) £3,455,547 (£4,328,699); drugs and medicines £1,565,692 (£1,382,700); dyes and dyestuffs £970,660 (£761,304); paints and pigments £1,002,636 (£1,046,510).

In the first nine months of this year exports totalled £64,546,670, an increase of £2.344,969 over the same period of 1948.

Representative totals are as follows:—

CHEMICAL EXPORTS

	Sept. 1949	Sept. 1948
	Cwt.	Cwt.
Formic acid	1,131	3,286
	lb	lb.
Salicylic acid and salicylates ...	373,315	254,382
Value of all other sorts of acid .	£97,015	£90,776
	Tons	Tons
Aluminium oxide	17	125
Sulphate of alumina	2,397	2,304
All other sorts of aluminium compounds	610	445
Ammonium sulphate	15,677	33,057
Ammonium nitrate	2,221	6,538
All other sorts of ammonium compounds	1,775	1,957
Bleaching powder	12,430	60,076
	Cwt	Cwt.
All other bleaching materials ...	12,427	17,707
	Gal	Gal.
Cresylic acid	112,206	168,020
Tar oil, creosote oil, anthracene oil, etc.	2,854,128	2,810,660
Value of all other sorts of tar oil ...	£55,104	£40,659
	Cwt.	Cwt.
Collodion cotton	1,378	1,283
	Tons	Tons
Copper sulphate	1,381	435
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	37,090	62,706
	Tons	Tons
Fertilisers	1,016	1,239
	Cwt.	Cwt
Nickel salts	3,625	5,350
Lead acetate, litharge, red lead, etc.	7,193	8,223
	Gal.	Gal.
Tetra-ethyl lead	154,260	50,656
	Tons	Tons
Magnesium compounds	801	797
	Gal.	Gal.
Methyl alcohol	6,294	13,404
	Cwt.	Cwt.
Potassium compounds	4,352	11,367
	Tons	Tons
Salt	18,456	21,316
	Cwt.	Cwt.
Sodium carbonate	278,527	334,828
Caustic soda	206,406	258,370
Sodium silicate	40,095	23,920
	Cwt	Cwt
Sodium sulphate	30,667	16,089
All other sodium compounds ...	70,970	89,173
Cream of tartar	609	92
Tin oxide	320	359
	Tons	Tons
Zinc oxide	1,147	1,768
Value of chemical manufactures, excluding drugs and dyestuffs ...	£3,455,547	£4,328,699
	Oz.	Oz.
Quinine and quinine salts ...	215,251	192,206
	Lb.	Lb.
Acetyl-salicylic acid	165,190	118,051
	100 International Units	100 International Units
Insulin	784,704	753,192
	Mega Units	Mega Units
Penicillin	848,451	323,340
Total value of drugs, medicines and preparations	£1,565,692	£1,382,700
Total value of dyes and dyestuffs ...	£970,660	£761,304
	Cwt.	Cwt.
Plastic materials	40,218	33,654
Value	£445,064	£431,731
	Cwt.	Cwt.
Chemical glassware	1,318	1,279
Value	£50,901	£45,513
	Cwt.	Tons
Fans	4,984	232
Value	£145,196	£113,626
	Cwt.	Tons
Furnace plant	5,981	258
Value	£70,183	£58,664
	Cwt.	Tons
Gas and chemical machinery ...	19,375	690
Value	£284,272	£180,102

CHEMICAL IMPORTS

	Sept. 1949	Sept. 1948
	Cwt.	Cwt.
Acetic anhydride	11,055	5,431
Acetone	--	6,763
Acetic acid	—	15,851
Boric acid	3,420	4,930
All other sorts of acid	2,360	3,216
Borax	1,000	22,950
Calcium carbide	1	31,535
Coal tar products (excluding benzol and cresylic acid) ...	—	10,442
Cobalt oxides	614	603
	Tons	Tons
Arsenic	975	570
Fertilisers	—	390
	Lb.	Lb.
Glycol ethers and glycol ether-esters	1,016,817	459,837
Iodine	151,391	—
	Cwt.	Cwt.
Potassium chloride	675,058	801,136
Potassium sulphate	33,398	8,576
All other potassium compounds ...	2,666	5,371
Sodium nitrate	60,000	69,790
All other sodium compounds ...	6,544	6,777
	Tons	Tons
Sulphur	69,614	77,340
	Cwt.	Cwt.
Carbon blacks (from natural gas)	44,160	106,567
Total value of chemicals, drugs, dyes and colours	£1,905,849	£2,613,585

LABORATORY PROCESS PLANT IN GLASS

Widening Usefulness of Shock-Resisting Assemblies

A WARTIME development of the use by chemical and other industries of plant and equipment made entirely of glass components, occasioned principally by lack of the customary materials, has become an established practice and promises to extend to a widening field of chemical activity. Some conspicuous advantages of glass surfaces and often a saving in capital cost combine to hasten the acceptance of that policy.

The ready availability in glass of many familiar items of factory and laboratory equipment and apparatus is also playing an important part in this extension of the chemical uses of glass. This is made possible by the specialisation and standardisation by such firms as Quickfit & Quartz, Ltd. (a subsidiary of the Triplex Safety Glass Co., Ltd.), whose factory at Stone, Staffs.—started in August 1946—we were enabled to visit this week.

In the enterprise, the company has been encouraged by numerous recent examples of the acceptance by chemical industry of glass equipment on its own merits. A typical case was a chlorination plant where 20 large lead condensers were replaced by glass condensers and the change was stated to have effected a saving of £2000 a month in maintenance costs and a fourfold increase in production.

In a wartime nitric acid plant, stainless steel condensers in use in three departments were found to have an average life of only three weeks each. Production was curtailed by the inability to run the sectional plants separately, and finally the problem of obtaining stainless steel became acute. One glass condenser was supplied which, when the war ended, had been in use continually for 12 months, and the one plant had, in fact, supplanted the original three.

Seen in process of fabrication at Stone were numerous examples of laboratory glassware with interchangeable conical ground-glass joints, produced from glass tubing and flask mouldings. The cones and socket blanks are preformed on lengths of tubing or on flasks, and are annealed before the grinding operations which produce the final accurate taper for ensuring gas- and liquid-tight seals.

After a final inspection, the finished interchangeable joints are either sent to the stores for direct sale or re-issued to the lampworkers for assembly into the

Edge-grinding larger heat-resistant vessels in a flat mill. Above, left: Grinding the shaped neck of a flask to provide a gas-tight joint various units of scientific plant being made. Thorough inspection is carried out at all stages—of the ground-glass joints for accurate size and fit, of blown-ware primarily for conformity to standard, for general appearance, freedom from strain and pin holes.

Large Glass Condensers

The glass condensers made at the Stone factory are claimed to be the first of their kind in glass in plant scale. In these, the special cooling-coil assembly uses the available space to the full. High velocity of coolant through the coil ensures the minimum thickness of stationary film.

Smoothness of surface finish is also an important factor contributing to this and, it was pointed out by the Quickfit experts, to the superiority of glass over metals for certain purposes. Metals, it is recognised, score over glass in thermal conductivity, but metal tubes in condensers are seldom found to be smooth, and, in fact, hold a considerable film of stationary liquid or gas, and provide a good foundation for growth of scale. In glass, it has been found that there is little tendency for scale or deposition to develop and, if formed, they are readily visible, so that steps can be taken for cleaning.

A practical example of the resistance to thermal shock concerns the use of a 15 sq. ft. glass condenser situated at the top of a still. While distilling acetic acid, the still caught fire at the base. Flames passed both around the outside and through the centre in contact with the cooling coil still circulating cold water, until the rubber feed tubes were burnt away from the water connections. After the flames were extinguished, the glass condenser was found to be intact and was put into service again.

Glass stills are now available in sizes of use to commercial production. Batch stills having vessels of 10, 20 and 50 gallons capacity are available with a range of fractionating columns, stillheads and condensers. Continuous stills employ steam-heated vessels and standard column sections with small feed sections which can be built up into the appropriate lengths for stripping and rectifying.

Glass chemical plant is manufactured to withstand widely differing conditions of service, including high pressures and temperatures, vibration, and chemical action. The normal maximum working pressure of gas plant up to 3 in. diameter is stated to be 100 p.s.i.; 4 in. diameter, 60 p.s.i.; 6 in. diameter, 50 p.s.i.; 9 in. diameter, 20 p.s.i.; 12 in. diameter, 10 p.s.i. Higher pressures can be worked for special re-

(continued at foot of next page)

Supplementing the supply of standardised pieces, much specialised apparatus is required the production of which, from blue prints, is shown here. Left: fitting specialised parts to a standard piece; right: this piece is made by hand throughout to satisfy particular requirements

COPPER SULPHATE SALES

Big Improvement in Exports

A GRATIFYING measure of recovery in the export markets was recorded by Mr. J. D. McKechnie, presiding at the 25th annual meeting in London last week of the British Sulphate of Copper Association. He noted with satisfaction that the previous season's poor export result had been exceeded by about 10,000 tons. Last season's total was 34,810 tons, compared with 24,236 tons in 1947-48.

Restrictions

"These better results," he said, "were not obtained easily; on the contrary, there were many difficulties connected with import restrictions and shortage of sterling in certain countries to be overcome. As in previous seasons, we have worked in close co-operation with the Board of Trade, and we have received every assistance from them, and also from the British Embassies in our export markets.

"The outlook for the 1949/50 season is promising and, provided there are no payment difficulties due to shortage of currency, the association expects to be able to increase its exports over last season's.

"Following the devaluation of the £ sterling, the U.K. price of copper was raised, and the members were obliged to increase the price of sulphate of copper to cover the higher cost of raw materials. It is too early yet to say how this increase in our costs will affect our competitive position in European markets.

Fluctuating Metal Price

"The manufacture of sulphate of copper at a stable price during the past season has not been facilitated by the constant fluctuations in the price of copper and, unfortunately, there is no Metal Exchange to enable us to cover sales. Stability of sulphate of copper prices is desirable for the promotion of sales, but this is virtually impossible under present conditions pertaining to copper.

"There have also been further increases in wages during the past year, and more wage claims are said to be in the offing. It should be emphasised that continued increases in costs will sooner or later result in our not being able to meet foreign competition in our export markets; and it must not be forgotten that, before the war, foreign makers were in a position to produce at lower cost than we were, and that this state of affairs may well arise again if the demand for higher wages persists."

RIC IN SCOTLAND

Formation of New Section

A NEW section of the Royal Institute of Chemistry has been formed in Dundee to serve that city, and the counties of Angus, Perth and Fife. Chemists in the oil, plastics, textile, food and engineering industries are included in the new section as well as a number of groups from colleges and schools.

Dr. Robert Roger, lecturer in chemistry, University College, Dundee, took the chair at the initial meeting. Mr. Andrew Dargie, public analyst, outlined the development of the institute's membership in the county and the decision to establish a separate branch.

Officials appointed were Mr. Andrew Dargie as chairman and Dr. Robert Roger, vice chairman. The hon. secretary and treasurer is Mr. W. Stewart Liddle, Dundee. The committee comprises Messrs. Alexander Hood (Bell-Baxter School, Cupar), Douglas M. G. Lloyd (The University, St. Andrews), George F. P. Parsons, Herbert L. Parsons, and Henry A. Watson. The hon. auditor is Mr. N. B. B. Johnstone (Technical College).

LABORATORY PLANT IN GLASS

(*continued from previous page*)

quirements by arrangement with the manufacturer.

The maximum working temperature can be considered as 300° C. For temperatures above 150° C., however, precautions should be taken to prevent excessive thermal shock such as chilling with rain or snow. Glass pipe-lines are claimed to withstand all normal pump and machinery vibrations, provided when connecting these to vibrating machinery rigid support is not made within approximately 10 ft. of the vibrating equipment.

Glass is suitable for use with all acids with the exceptions of hydrofluoric and hot concentrated phosphoric acids. It may be used successfully with dilute alkalis, but is attacked by hot strong caustic solutions.

Quickfit & Quartz, Ltd., is exporting examples of its glass equipment in a modest way to the U.S.A. Total exports to all countries are in the neighbourhood of 40 per cent of production. Overseas customers include Australia, New Zealand, India, South Africa, Scandinavia, Belgium, Holland, Switzerland and Egypt. Recently a record individual shipment of some £6000 worth of laboratory glassware was sent to Australia, and three months ago the company sent a piece of glass apparatus to Canada for the first time.

MANUFACTURE OF VERY TOXIC CHEMICALS

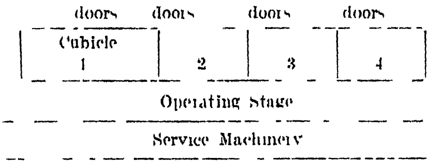
*Plant Layout and Workers' Welfare**

by S. B. CORMACK, M.A., D.Sc., Ph.D., F.R.I.C.

IN both these examples (of contamination of electric motors by toxic vapours) a complicated electrical instrument was used, but the connection between the toxic area and the instrument was only two wires. All the complications were non-toxic. In the first case, the only toxic portions were two insulated wire coils outside a glass tube, and in the second a very robust microphone and a small air jet which could be removed and replaced in a matter of minutes.

When a ship is designed it is usual practice to make a scale model. This is sometimes practicable for chemical plant, and I think it is most valuable for toxic plants. It is of use to the design engineers, even though they claim to be able to assimilate all the details from the drawing board; it is of use to chemists who do not always claim such omniscience, and it is certainly of great value to all the labour and medical authorities who are so deeply involved in the detailed organisation of the plant. Finally, it is of great assistance in teaching the process worker.

The usual design of building is to have a series of cubicles or large scale fume cupboards to house units of plant. These cubicles are glass fronted, and all controls are operated from outside the cubicle, or by opening a slide window and putting a hand just inside. A typical layout is illustrated in the following diagram:—



The plant is inside the cubicles 1, 2, 3, 4, and the sides towards the operating stage are Triplex glass fronted. All controls are reached from the operating stage. Access to the cubicles is only gained through the doors opening at the back, and the key to these doors can only be issued on the instructions of a senior official. It is usual to tile the walls or use a high gloss paint so that they can be washed down easily, and the corners are rounded for the same purpose and to reduce dust collection. On the other side of the operating stage is the building which houses service machinery such as air compressors, to give a compressed air supply for operating controls, vacuum pumps, pumps for non-toxic intermediates and so on. Any machines which may be potentially toxic are set apart and ventilated if necessary.

Building Design

In the design of the building one should not forget that cleanliness is important, and washing down will be frequent. It is essential that all floors drain, and drain quickly. Very few do. There seems to be an inherent objection among many civil engineers to floors which have sufficient "fall" to drain properly.

One of the major items in the building design is, naturally, the ventilation arrangements. I have already outlined the cubicle system with the operating stage in front. Of course, the basis of all the ventilation schemes is to extract potentially contaminated air from the cubicle. This can only be efficiently done by independent trunking to the top of each cubicle, although the individual connections may, of course, join a main duct outside. The distribution of the suction to each cubicle should be controlled by the size of ducting and not be dependent on any valve arrangement.

It is better to take the foul air from the top, even if the vapours are heavier than air, because convection currents due to heat from the plant generally far surpass any effect due to vapour density. The fresh air to replace the offtake is again best admitted by an independent duct to the outside atmosphere and not from the operating stage, for which independent arrangements should be made.

The degree of ventilation depends on the nature of the substance handled, but the general tendency is to make sure that the cubicle is swept through with fresh air as frequently as possible, and air flows which correspond to a rate of change of air in the cubicle of 40, 60 or 120 times per hour are not uncommon. For the operating stages changes of 15 to 20 an hour are more usual.

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* Conclusion of abstract from the paper presented before the North Western branch of the Institution of Chemical Engineers in Manchester on October 8, commenced in last issue, pp 568 570

Ventilation to this degree is expensive. Large capacity fans are required to move these large volumes of air, which in cold weather must be heated, particularly for the building section where plant will be working. As an example of the scale of these arrangements, I may mention one large installation to ventilate buildings in which very toxic material was handled and in which the two main fans each moved 234,000 cu. ft. of air per min. and were driven by motors of 275 h.p. The steam consumption for heating the air alone varied from five to ten tons an hour.

Ventilation Tests

Whatever ventilation system is decided upon, it is most important to test it at an early stage so that it can be modified if necessary. The test in which I, personally, have most faith is to let off a smoke generator inside the cubicle and allow the whole cubicle to become filled with smoke, then switch on the ventilation, open all the access points if there are any, and see what happens. If any smoke comes out into the operating stage or where men may be working, the ventilation is inadequate. It is no use people saying that the test is too drastic. The toxic material which is to be manufactured will be drastic enough if it gets a chance.

Nor are the problems of ventilation solved when we have achieved an adequate flow of air in the cubicle and when the test has been found to be satisfactory.

What happens to the exit air? One method, adopted perhaps more in America and Germany than here, is to pass all the fumes into a very tall chimney so that they are discharged clear of any buildings, and sufficiently high in the air so that even if, under certain atmospheric conditions. they tend to come down, they will be so dilute as to be innocuous. This solution is no longer favoured in this country, and is becoming less favoured abroad. And rightly so.

Every effort should be made to destroy the toxic constituents before they are discharged to the atmosphere, and the plant design cannot be considered complete until this is done. The methods adopted depend on the nature of the material handled. It may be possible to use a packed tower, or a proprietary type of air washer, or passage through the boiler plant flues, if the material is destroyed by heat and does not give acid decomposi tion products.

From the treatment of gaseous effluents, we turn to the treatment of solid and liquid effluents. We all know how these are apt to get overlooked in the laboratory stage. More and more I have realised the full meaning of the remarks of my university chief, Prof. G. G. Henderson, who gave me this advice when I left him to go into industrial work, " Well, my boy don't forget, in industry you won't be able to pour your residues down the sink." Our ancestors solved this problem by dumping solid refuse around the factory and pouring the liquids into the nearest stream, and so we have unsightly waste heaps around our works and less fish in our streams. These things are not accepted nowadays with normal refuse, still less so with toxic effluents.

All residues must therefore be collected in a treatment system where they can be detoxified before disposal. The usual method is to provide a pit which is capable of holding the normal flow of materials for a sufficient time to allow decontamination to be complete, and to provide also for breakdown conditions on the plant.

This means that the pit should be large enough to take the contents of one of the largest plant vessels in case of an unexpected failure of that vessel. All effluents and all drainage from toxic areas must run to that pit. If the final discharge is to tidal waters it may also be necessary to arrange for sufficient capacity to be installed for the pit to be discharged only on the outgoing tide

Distant Controls

If we could construct the plant satisfactorily inside cubicles with distant controls so that no one need go near the plant items and if the ventilation arrangements were perfect, there would be no reason for the plant operators to wear any special clothing or take any particular precautions. With the resources at our disposal and the development of measuring instruments and controls, the ideal is becoming more attainable. But, since in dealing with highly toxic materials the consequences of a mishap are so serious, because, in short, the penalty for a little inattention on the part of an operator may be serious disablement or loss of life, it is necessary to have what might be called a second line of defence.

This second line of defence is the provision of protective clothing. Even after this there is a third line of defence—the first aid and medical arrangements. If the plant equipment fails, if the protective clothing fails, if first aid is insufficient, there is still left the resources of the factory medical station and, if necessary, all the skilled attention and specialised equipment of the hospitals.

All these arrangements revolve round the labour, welfare and safety organisation. This covers a very wide field, and there can be no attempt to deal with it adequately at this time. But all those who have had experience of factory management know how much time these affairs can take up, even in normal factories—what *The Economist* has described as "the fearful pre-occupation with lavatories, washbasins and lockers for clothing." In factories dealing with toxic material this "fearful pre-occupation" can rise to tremendous heights, and it is not uncommon to find that the whole of factory activities revolve round the change rooms.

In dealing with the repairs to a joint on a toxic pipe line, we had a hint of the elaborate organisation necessary to provide everyone with adequate protective clothing, and we shall leave it at that. Similarly, we shall just remind ourselves that an extensive medical organisation must be established, but let us also remember that the function of a proper medical department is not simply to treat casualties, but to promote safe and efficient operation of the factory by assisting in accident prevention and the control of toxic hazards.

The medical department must also provide the first aid instructions to deal with personal contamination. These instructions must be simple, easy to remember and easy to follow. When the need arises, people are not likely to be able to remember, still less to carry out, anything but the simplest instructions.

Operating Instructions

When we have designed and built the plant, when we have made arrangements for the protective clothing and safety devices and the enormous organisation behind them, we have still something else to have ready before we start to employ any labour on production. We must have detailed operating instructions for all sections of the plant, and these should cover, as a matter of routine, the action to be taken in the event of plant breakdowns, failure of electric power and similar occurrences. It is no use the staff saying it cannot be done. It can be done! And it must be done!

In addition to giving full instructions to the people involved, these instructions are a most valuable aid for accident inquiries, and the preparation of them means that the members of staff concerned must study the plant in complete detail.

We are now ready to engage the men. What do we tell them, and how do we train them? First of all, what we tell them should be agreed, and all members of the production staff as well as the labour, welfare and medical departments should all say the same things about the precautions taken to avoid injury, the first aid treatment and the effects if anything does go wrong. It must be emphasised that the risk is negligible because of the design of plant and that, in fact, conditions are better and safer than in many normal plants.

If the members of the staff do not honestly feel that they can say this, then they should go back and redesign the plant until they can say so. The attitude towards the wearing of protective clothing and bathing and changing should be that it goes with the job. The money is paid for doing these things as well as for operating the plant. The use of the term "danger money" is to be deprecated.

Staff Training

When the initial selections have been made and the men are ready to start work, they should be given a short training course. During this course a series of talks is given by the staff operating the plant. This not only tells the men about the job, but lets them see that the members of the staff are fully familiar with the work and enables everybody to get to know one another.

During this preliminary training the men should be given every opportunity to become familiar with the plant controls and general layout. When we are satisfied that they are reasonably competent, arrangements can at last be made to start operation. But even yet we must not hurry. We must run the plant on some relatively innocuous material resembling the final product until everybody is completely familiar with what happens, and above all until all the plant items have been thoroughly tested under conditions as near to production conditions as we can arrange.

In one case where we had to use a chlorinated solvent in the process, we ran the plant on the solvent for three weeks until every man was fully familiar with all the controls he had to operate. These "mock runs" must be taken as seriously as a dress rehearsal, and full precautions must be observed, including the wearing of protective clothing, and every spill must be regarded as toxic.

Finally, the plant is made "toxic" by starting production of the material for which it has been designed. If we make

(continued overleaf)

A New Fluorine Compound

Industrial Adaptability of Sodium Trifluoroacetate

SODIUM trifluoroacetate, CF_3COONa, is a new fluorine compound available in pilot plant quantities in the U.S.A. for appraisal by the chemical industry. It is a white, odourless, non-corrosive and free-flowing powder. Unlike the monofluoroacetates which are extremely toxic, and difluoroacetates which are moderately so, this salt is non-toxic. Sodium trifluoracetate is very stable up to 300° C., when decomposition takes place with the formation of carbon dioxide, carbon monoxide, trifluoroacetyl fluoride and trifluoroacetic anhydride. The new salt is resistant to hydrolysis and is not attacked by aqueous alkali at the boiling point.

The commercial grade of sodium trifluoroacetate usually has a purity of 98-99 per cent, the most common impurities being sodium chloride, carbonate and sulphate, and traces of moisture. The salt is freely soluble in water at room temperatures, fairly soluble in ethyl and methyl alcohols and also methyl ethyl ketone, slightly soluble in ether, but insoluble in benzene, carbon tetrachloride and perchloroethylene.

The physical and chemical properties of sodium fluoroacetate suggest its use as an intermediate in the preparation of herbicides, insecticides and dyestuffs, and as a condensing agent. Prominent among its reactions is its conversion to ethyl trifluoroacetate by treatment with ethyl alcohol and sulphuric acid. This ester can then be reacted with ammonia to form trifluoroacetamide, which may be changed into the nitrile by the action of phosphorous pentoxide.

The chief value of sodium trifluoroacetate lies in its readiness of conversion to trifluoroacetic acid, which is the starting off point for a number of important reactions. This acid is as highly ionised as hydrochloric acid. It fumes in moist air, and its azeotrope with water boils at 105.5° C. and contains 79.4 per cent trifluoroacetic acid. The acid is highly reactive, and when treated with phosphorous pentoxide it changes into trifluoroacetic anhydride which on hydrogenation will give trifluoroethanol. Benzoyl chloride reacts with trifluoroacetic acid to form trifluoroacetyl chloride.

Vinyl trifluoroacetate can be produced when the acid is allowed to come in contact with acetylene, and in the presence of catalysts the trifluoroacetate is changed into the polymer.

MANUFACTURE OF VERY TOXIC CHEMICALS

(*continued from previous page*)

any mistake now, we must pay the penalty. There is, however, just the chance that something has been overlooked and that there is a very slight escape of toxic material into some place where people are working. We should, therefore, put particular emphasis on tests of the plant atmosphere until we are satisfied that no danger exists. If some type of continuous recording instrument can be devised, then we are fortunate indeed.

I know of one plant manufacturing very toxic materials for which a very sensitive analytical test had been devised. This was employed in continuous recording instruments all over the plant. An immediate alarm was given for a dangerous concentration, and all the charts were sent each day to the medical department. This department was given full authority to have any section shut down if the charts indicated that conditions had become abnormal—even without being dangerous. It was interesting that the first warning of irregularities in plant operation often came from the medical department!

It is not always possible to achieve such a desirable result as to have a continuously recording analytical instrument. On another plant we found that the most sensitive detector was the human nose. People used to laugh at this, but it was a fact that the trained nose could warn of an increasing concentration which was later revealed by analytical tests. We did not, in fact, employ people in that particular plant if their sense of smell was deficient.

On phosgene we allow people to smoke. The taste of a cigarette in even a minute concentration of phosgene is quite sufficient to make the process man do something about it, and quickly too.

So we have come to the stage at which we are operating the plant on toxic material, and if all our work has been right we should continue to operate it efficiently and safely.

NEW PLASTIC FOR CHEMICAL INDUSTRY?

Possible Advance on PTFE

From A CORRESPONDENT

A POLYMER of trifluorochloroethylene now produced commercially in the U.S.A., appears to offer important advantages over polytetrafluoroethylene (THE CHEMICAL AGE, *60*, 10-14) as a material for fabricating parts of chemical plant, such as valve seats, valve packings, pump packings and diaphragms, chemical pipe, tubing and gaskets; as protective coatings on chemical processing equipment and containers, and as collapsible bags for the storage of liquid fuels, including fuming nitric acid.

Like PTFE, the new polymer has a high resistance to chemical attack. No effect has been observed after prolonged exposure to concentrated sulphuric, hydrofluoric and hydrochloric acids, to strong caustic, to fuming nitric acid, aqua regia and other vigorous oxidising agents. It is equally resistant to most organic solvents but is slightly swelled and plasticised by highly halogenated materials and some aromatics.

The plastic is currently supplied in three different grades representing three different molecular weights. Average density is 2.1; Rockwell hardness (R scale) 111-115; impact strength (Izod notched 77°F., 3.62 ft. lb./in. notch. tensile strength 5730 p.s.i. at 77° F.; flexual strength 8260 p.s.i. (77° F.) and compressive strength 32-87, 600 p.s.i. (77° F.). The thermal coefficient of linear expansion—80° to 20°C.—is 4.5×10^{-5} in/in/°C. and from 20°C. to 150°C. 7×10^{-5} in/in/°C. Thermal conductivity is 1.44×10^{-4} cal/cm^2/°C./cm. and specific heat 0.216/grm.

Commercial Application

The obvious performance advantages of this fluorine thermoplastic inherent in its unique chemical and mechanical properties can be realised in commercial application only through carefully controlled moulding. It has been shown by extensive experimental work that this plastic can be moulded by compression, injection, transfer and extrusion methods with conventional equipment. In addition, the plastic can be machined easily and the head sealed.

Unlike PTFE, the plastic is remarkably amenable to heat treatment; thus it may be made relatively soft and resilient, resembling a plasticised material, or harder and less yielding without expensive processing. A significant feature of such treatment is that no sacrifice of any of the stability characteristics is made.

Whereas PTFE is a dense and generally opaque material in massive form, the new fluorine polymer can be made transparent or translucent to visible light as desired. It is also sufficiently transparent to longer wave lengths for use as a window material in the infra-red region.

Transparency

Rapid cooling or quenching of the plastic moulded material through 400° to 300° F. temperature range produces both transparency and flexibility, proportionate to the rate of cooling. Complete quenching is possible only with relatively thin cross-sections, due to the insulating properties of the polymer. Thick cross-sections which are rapidly cooled vary internally in physical properties with distance from surface.

Quenched 1/16 in. sheet is almost perfectly transparent, while 1/8 in. sheet has a slight blue haze. This is due to light scattering by crystallites and is a condition that becomes progressively more apparent in thicker sections, from which transmitted light has a noticeably yellow or pink colour.

Generally speaking, some crystallisation is induced by the slow cooling of moulded polymer from the transition temperature, or by subsequent heat treatment of quenched material at temperatures approaching its transition temperature. The degree of crystallisation in the freshly moulded plastic is dependent on the rate of cooling

Polymers of trifluorochloroethylene do not possess such outstanding resistance to heat as PTFE and as an average the temperature range is from −320°F. to 375° F. The inclusion of a chlorine atom in the polymer also makes it inferior to PTFE as an insulating material at very high frequencies.

So far it has found its main uses in the electrical industry as insulation and wire coating and condenser foil for applications under corrosive .conditions at extended temperature ranges in motors, transformers, control instruments, etc.

PAPER AND TEXTILE FIBRES

Competitive Research Enriching Technology

By Dr. G. ULLMAN*

PAPER has now started, and continues with enormous speed, to invade the province of textiles, and it seems to be a most successful attacker, well supported by its cheapness.

Let us consider first of all the main points where textiles are losing ground, such as sacks, which were mainly constructed from jute. But in the U.S.A. and elsewhere this was largely replaced by paper. This was much more effective when it was found how to protect paper by impregnation against the influence of water, mould, insects, etc.

The effectiveness of the present cement bags is clearly seen and it is worth noting, among other things, that 60 per cent of America's domestic flour is packed in paper.

Artificial Fibres

If you consider the probably increasing need for fibres in the future and ask from what source they can be supplied for both pulp and textiles, you may agree with me that the soil will be unable to fill the gap. Man-made fibres will have to do that. The chemical pot is elastic, nature is not.

Some technical reasons may be added here. It is not so many years ago that it was regarded as impossible to produce suitable rayon pulp from something else than a particular kind of wood, especially soft wood. Since then, chemists have succeeded in using other starting materials for a satisfactory rayon pulp, using hardwood and also many types of agricultural wastes from annual crops which are available in every land and could enable practically all countries to become to a great extent independent of imported raw materials.

Paper insulating materials for the electrical industry have to some extent supplanted silk and cotton and the industry finds many uses for items made from paper which once were of textile material.

The technical relations between paper and textiles are numerous and I can list only a few of the many similarities in working methods. First of all, close relations exist between production of paper pulp bleached or unbleached, and the similar methods employed by the textile industry to boil and bleach vegetable fibres. New mechanical and chemical developments worked out by one trade are equally studied and used in the other. One has borrowed from the other for processes of impregnation for fire-proofing, insect-proofing, mould resistance, softening, stiffening, crease resistance and nearly every process one can mention.

Let me mention only the revolutionary trend in bleaching, which I think was started by the economical and therefore extensive use of peroxides, and which is now directed to chlorites and chlorine dioxide. Finishing, coating, filling, etc., of paper is similar in many ways to processes used for textiles. Both serve as bases for resin finishes for making leather-like fabrics, etc.

One could mention a number of similarities between pigmented papers and printed textiles and between dyeing applied to paper and to textiles. Perhaps paper-dyeing may be more closely linked with dyeing of loose cotton, slivers or yarns, because that is more akin to the common method of adding colouring matters to paper-pulp in the beater stage.

Textile Dyestuffs

The paper colourist has taken and adapted to his purpose many dyestuffs produced originally for textiles, although his range of types and processes is more limited. The textile dyer has more control through his range of working temperatures and possibilities of after treatment, etc .

It is of interest to note that silk screen printing has developed greatly in both paper and textile trades. One recent machine for this process was designed for textiles, but has now been adapted to wallpaper work.

The mechanical finishes are also very similar and, at least as far as calendering is concerned, paper is probably much more advanced. Increasing the water-proof qualities of both materials is a common target.

In this connection an interesting development is the use of metal-foil-surfaced paper as a heat insulation material, and we have seen its effective application in such places as constant temperature testing rooms.

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* Extracted from a paper " Some Relations, Economical and Technical, between the Pulp and Paper Trade and the Textile Trade," by Dr. G. Ullman, read by Dr. P. Bean before a meeting of the Society of Dyers and Colourists in Manchester on October 21.

One problem which is common to both industries is that of providing good and clean water for manufacturing purposes and, perhaps much more important, dealing with their effluents, a matter which becomes daily much more difficult. Both trades have also similar problems and processes in humidifying.

For many years my work has been divided between the textile and the pulp trades, and I have been fortunate in having the opportunity to develop various processes.

I had some success with a pretreatment of slivers, treating them for a few minutes only with a hydrochlorite solution at a temperature of about 40-50° C. in an alkaline medium.

As a textile man, I was always accustomed to pretreat the material by desizing before putting it into the digester, and I find it surprising that in pulping processes there is practically none where a pre-cleaning treatment is used comparable with desizing of textiles. This means that pulping processes tend to be done in one rather brutal operation.

It became clear that if some of the natural impurities of cotton were attacked by such an acid pretreatment, it would help remarkably the following alkaline boiling process. In these circumstances it is not astonishing that, when studying improvements in the pulping of straw, acid pretreatment of sized textile fabrics came to mind.

Separation Problems

Naturally, a material like straw, etc., is very different from cotton because the latter contains only, say, about 8 per cent of natural impurities and raw pulp-material like straw and many others of this kind have about 50 per cent. It was known that an acid pretreatment acts especially on the hemicellulose contained in such materials, which amounts to about 25-30 per cent of the weight of the raw material and this, mainly pentosans, is hydrolised to sugars, and in that way removed from the material.

Pentose sugars have many interesting uses, as a basis for production of such yeasts as *Torula utilis* and for production of furfural, or, furan products.

When we started these studies I came to a rather promising result, and we had no knowledge that processes based on the same principles had been developed during the war in Germany. But there the main and only target was rayon pulp, by processing pentosan-rich materials like hardwoods, cereal straw and, as we heard later, in the East, rice, etc.

In these cases the removal of all pentosans is the main target, regardless of the fact that the fibre is attacked and the chain length of the cellulose molecule shortened accordingly. We could not do this, because paper fibre has to keep its strength and other good physical properties. It was a most tiresome and difficult way to come to the results, whereby we can extract enough of the sugars with suitable economy and make the treated material much more suitable for a milder digestion and bleaching than normal, and achieve a satisfactory yield and shade.

Dr. Campbell, who was working in the Forest Products Department at Princes Risborough, has also worked and obtained patents on nitric acid pulping for manufacturing of fodder cellulose.

Acid Processes

We were, of course, fully aware of most essential differences between dissolving starch by an acid hydrolysis process in the one case, and in our case, treating row cellulosic materials, in which the fibres are embedded in a very large quantity of natural impurities, including mineral matter and larger amounts of hemicelluloses and lignins.

In all cases, textile or paper, it must be strongly emphasised that the fibre must have protection by its coating of impurities. This enables it to withstand a treatment which would have serious consequences on a cleaned and unprotected fibre.

The acid attacks mainly the hemicellulose and converts it to soluble sugars, mainly the pentose xylose, whereas hydrolysis of starch leads to the hexose-glucose.

According to the conditions of the acid pretreatment, which again means variation in time, temperature, concentration and type of acid, you have it in your power to extract more or less of the pentosans from the natural fibre.

In practice the intensity of this process depends on what you wish to do with the acid pretreated material, after it has been pulped by an alkaline process and followed normally by bleaching.

Our intention was to produce economically a pulp for paper-making which has to retain a high quantity of hemicellulose, otherwise the pulp would not hydrate well and would be unsatisfactory for paper making.

May I say here that, although we have searched in many countries, and I have

New Fellows and Associates of the RIC

Pass Lists of the September Examinations

RESULTS of the September examinations of the Royal Institute of Chemistry have now been announced. The eight new Fellows are these:—

Branch E: The chemistry including microscopy, of food and drugs and of water:—

ALLEN, David George, B Sc (Lond.); **ANDREW**, Miss Gertrude Garland, B.Sc.(Liv.); **DAVIES**, David Richard Aylmer, B Sc.(Wales); **HUGHES**, John Sylvan, B.Sc (Lond.); **JONES**, William Elwyn, M Sc.(Wales), **RYMER**, Thomas Edward; **SCOTT**, Franklin Clermont, B.Sc. (Lond.).

Branch G: Industrial chemistry, with special reference to petroleum.

Associateships, numbering 37, were awarded as follows:—

ALLAN, Frederick James, Technical College, Paisley; **BARGH**, Jack, Lancaster and Morecambe Technical College; **BAYLEY**, Edwin Stanley, Wolverhampton and Staffordshire Techncial College; **BENNETT**, Albert Walter, Technical College, Coventry; **BIBBY**, Robert Heslam, Lancaster and Morecambe Technical College; **CLARK**, Arthur Wellesley Stewart, B.Sc.(Lond.), Technical College, Paisley; **CLARK**, Ronald, Sir John Cass Technical Institute, London; **CLAYTON**, Joseph, College of Technology, Manchester, and Royal Technical College, Salford; **COLES**, Lewis Edwin, B.Pharm.(Wales). Technical College, Cardiff; **COMPTON**, John, B.Sc (Lond.), Battersea Polytechnic, London; **COMRIE**, Allan McIntyre, B.Sc Pharm.(Glas.), the University and Royal Technical College, Glasgow, **CRAVEN** Anthony Ronald, College of Technology, Manchester, and Royal Technical College, Salford; **DRAKELEY**, Kenneth Douglas, Central Technical College, Birmingham; **HARRISON**, George Maxwell, Technical College, Huddersfield; **HERSOM**, Albert Charles, West Ham Municipal College and Sir John Cass Technical Institute, London; **HOWE**, Brian Keith, King's College and Battersea Polytechnic, London; **HO-YEN**, Joseph Ephraim, B.Sc.(Lond.), Chelsea Polytechnic, London; **KNIGHT**, Roy Albert, B.Sc.(Lond.), Acton Technical College, London; **MAY**, Albert Edward, South-West Essex Technical College, Walthamstow; **MUIR**, John Wilson, B.Sc Agric.(Glas.), the University and Royal Technical College, Glasgow, and Robert Gordon's Technical College, Aberdeen; **NODEN**, Frederick Gerald, Technical College, Widnes; **PARKER**, John Colin, Technical College, Newport; **REEVE**, Lawrence, Royal Technical College, Salford. **RUSSELL**, James, College of Technology, Leeds, and Technical College, Bradford; **SAUNDERS**, John Joseph, City College of Technology, Liverpool; **SHALGOSKY**, Harry Ian, Municipal Technical College, Hull; **SMEATON**, Robert Scott, Royal Technical College, Glasgow; **STONES**, William Frederick, Rutherford College of Technology, Newcastle-upon-Tyne; **TANDY**, Graham Herbert, College of Technology, Bristol; **TAWN**, Alec Richard Hornsey, Municipal Technical College, Hull, and the Polytechnic, Regent Street, London; **WAIN**, Brian Jack, Central Technical College, Birmingham; **WALKER**, Kenneth John, Technical College, Bradford. **WEST**, Charles Samuel, Technical College, Derby; **WESTWOOD**, George Ernest, Municipal Technical College, Hull; **WHITING**, Roland, Municipal College, Hull; **WILDE**, Raymond John, South-East Essex Technical College, Dagenham; **WOOD**, Robert Ivan, Technical College, Coventry, and Northern Polytechnic, London.

PAPER AND TEXTILE FIBRES

(*continued from previous page*)

troubled many of my friends abroad and have made thorough searches also in Germany, it seems to us that we have been, to say the least, one of the first to suggest this process for the manufacture of paper pulp.

I had always the feeling that very often the importance of the pH value is overestimated, because the pH is far from being the only important factor and the individual properties of the acid should not be neglected.

About two years ago, I thought that we should use our experience with the acid pretreatment of paper-maker's cellulosic raw material for desizing of cotton goods, since we had learned much about how far we can go without damaging the fibre.

We also made some investigations of after-treatment of clean alkali-boiled pulp with hot acid and it was always a failure until we reduced the temperatures and made milder the other conditions.

Having in mind the low critical temperatures necessary when dealing with hydrolysis of cellulose within our desired limits, we think we have found our way for an acid after-treatment of pulp and even—maybe—textiles.

First of all we propose to use milder and different acids and use a powder, which can be more easily transported, stored and handled in the mills than is the case with strong acids. We add to that some suitable detergent, whose action is not necessary to describe. We have had reports of small-scale desizing trials which show that it is effective and has left the fibre strong.

Such a powder consists of nine parts of sodium bisulphate and one part of an acid resistant wetting agent, and in this case, we have also used Estralane, a sulphonated fatty alcohol.

I have stressed the severe competitition between the two trades, and I remain of the opinion that it will in some ways become more severe. It is desirable for each to watch development of the other and to take advantage of processes which can be adapted to either. Even though such competition may be severe, there is sufficient room for the development of both industries without harm to either.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

CONCLUDING a year-long investigation of the five-day "smog" which killed 20 persons and made nearly 6000 ill a year ago at Donora, Pennsylvania, the United States Public Health Service states in a 173-page report that the smog was the result of an unusual combination of warm, stagnant air and heavily smoke-polluted fog. The disaster proved "for the first time that air contamination in an industrial community can actually cause acute disabling diseases." Releasing the report, Surgeon General Leonard A. Scheele, of the Public Health Service, called for immediate research on both air pollution *per se* and the effect of polluted air in shutting out sunlight. He said that he was calling upon Congress for $250,000 as an added appropriation to aid in the furtherance of the work. Dr. Scheele said that Donora probably experienced another serious smog period in April 1945, "when there were almost twice as many deaths in the town as in any ordinary April or any ordinary month." To prevent such a recurrence, he recommended that fog-afflicted industrial centres keep a close watch on weather conditions and that operations of industrial plants be curtailed or shut down when dangerous conditions appear to be developing. No one chemical was found to be the cause of deaths and illnesses, although sulphur dioxide was listed as chief agent, coming from railroads, steamboats, and homes as well as from the Donora steel and wire and zinc plants. Older people, of 55 or over, were the most susceptible.

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The General Electric Company, Schenectady, is to grant non-exclusive licences on reasonable terms relating to one of its patents embodying a process of surface hardening of metals by cementation with antimony. U.S. Patent No. 2,032,912 refers to hardening articles of metals and alloys having a melting point between 750° and 1550°C., and containing 1-10 per cent manganese. The articles are electroplated with antimony and, at a temperature ranging from 400° to 620°C., a hardened layer consisting of a ternary compound of the metal is formed. The articles are further hardened by quenching and re-heating to 200-350°C.

Two new publications, "Chemical Safety Data Sheet SD-35" on methyl bromide, and a revised edition of the manual "Warning Labels," have just been issued by the Manufacturing Chemists' Association, Inc., Washington, D.C. The safety data sheet, the 35th in the series, offers essential information for the safe handling and use of the chemical. The data cover physical and chemical properties; shipping containers and materials handling, and indicate personal protective equipment. Health hazards and their control are also covered. The second publication is a completely rewritten and revised edition of the manual, "Warning Labels," which made its original appearance in 1945 and has been broadened in its scope. The 86-page manual is divided into three parts: (1) General principles involved in the design and preparation of warning labels for hazardous chemicals; (2) 180 illustrative warning labels for industrial chemicals; (3) 58 illustrative warning labels for industrial poisons. The principles set out have served as a basis for labelling requirements issued by several States and territories. The manual is intended to facilitate an effective, uniform pattern of chemical labelling throughout the U.S. industry.

* * *

The development of a new durable flame-retardant chemical, called "Erifon," for cotton and rayon textiles, which does not change the appearance or "feel" of those materials, and is durable to dry-cleaning, normal laundering, and weathering, has been announced by E. I. Du Pont de Nemours & Co., Inc. An inorganic chemical, Erifon is stated to differ from other flame retardants in that it reacts chemically with the cellulosic molecule of fibres, rather than merely coating the fibre surface. Consisting of a solution of titanium and antimony salts, it is claimed that Erifon will last the life of the fabric despite frequent dry-cleaning or normal home laundering, and exposure to rain and sun. Its effectiveness is weakened, however, by processes frequently used by commercial and industrial laundries. A flame held to any of the treated materials is said to char the fabric at the point of contact but the flame does not spread.

RECORD AMERICAN EXPORTS

Europe Still Takes Most U.S. Chemicals

UNITED States exports of chemicals and allied products in the first half of 1949, officially listed at $449,549,510, were the highest for any half-year recorded. Declines from this record total are expected for the second half of the year; preliminary July and August figures indicate that exports in these months amounted to $58,811,818 and $58,549,994, respectively. These results have just been recorded by the U.S. Department of Commerce.

Commenting on the international monetary changes, the Office of International Trade officials said they did not believe currency devaluations by major foreign buyers of American chemicals will have an early, appreciable effect on chemical exports. It is anticipated, however, that foreign chemical producers, whose U.S. sales had fallen during the past year, may cut their export prices to stimulate sales. This would be coupled with efforts to dispense with purchases from America. "The high quality of American-made chemicals" would continue to weigh heavily with foreign buyers.

The record high total of chemical exports in the first half year compares with exports of $444.5 million in the first half of 1948, and $414 million in the second half of 1948. The United States imported $125,905,618 worth of chemicals and allied products in the first half of 1949, but preliminary figures suggest that imports fell to $5,159,774 in July and about $7 million in August. Chemicals and allied products imports were $152,787,745 in the first half of 1948.

Chemicals specialties have come into prominence. Exports in this group amounted to $97 million in the first half of 1949, as compared with $81 million and $76 million in the first and second halves of 1948, respectively.

Other major U.S. chemical exports were these:—

	Jan.-June 1949 $	Jan.-June 1948 $
Medicinals and pharmaceutical products ...	97,100,000	96,000,000
Coal tar products	52,500,000	58,700,000
Industrial chemicals ...	68,000,000	75,000,000
Pigments, paints, and varnishes	41,300,000	42,000,000
Fertilisers	42,000,000	36,000,000
Naval stores, gums and resins	16,200,000	13,700,000
Sulphur	16,600,000	14,000,000

In every major group the value of exports in the first half of 1949 was greater than in the second half of 1948.

During the first half of 1949, Europe was the chief market for United States chemicals—a total of $130,833,647. Other important buyers were: America south of the Rio Grande, $122,381,559; Canada, $62,562,146; Asia, $102,765,824; South America, $71,796,385; Africa, $13,685,184 (with about half of this total going to the Union of South Africa); and Oceania (chiefly Australia), $8,086,911.

Among European purchasers, France first with $24.6 million, followed by the United Kingdom, $24.2 million; Italy, $15.8 million; Germany, $14.5 million; and Greece, $4.2 million.

The drop in U.S.A. chemical imports from Europe occurred chiefly in the United Kingdom, whose sales fell from $6.8 million in January-June 1948 to $4.4 million in the same period of 1949.

Parliamentary Topics

ASKED what increases there had been in the prices of the raw materials exported from the sterling area to the dollar area since September 18, the President of the Board of Trade said that, compared with the price ruling before that date, the dollar price of tin had been reduced by 8 cents a lb. This represented a rise in the sterling equivalent of tin exported from Malaya of about 33 per cent. Increases in sterling market prices for rubber (by 20 per cent), for rough diamonds (by about 25 per cent), jute and sisal (each by about 10 per cent) had been reported.

DEALING in tin are to be resumed on the London Metal Exchange on November 15; this information was given by the Minister of Supply in answer to a question by Sir John Mellor.

IN a written answer to Mr. J. F. Platts-Mills, the Minister of Supply (Mr. G. R. Strauss), stated that no radioactive isotopes had been supplied to Germany for atomic research. Isotopes had been supplied for medical and general research, against orders sponsored by the British scientific adviser in Western Germany. Conditions of sale included obligation to publish the results of research.

Technical Publications

THE problem of dealing with the accidental dispersion into the air of zinc oxide from rotary-type refining furnaces is discussed in the autumn issue of "Smokeless Air," the journal of the National Smoke Abatement Society. It quotes an instance where the nuisance was overcome by enclosing the furnaces, and providing ducts to carry away the zinc oxide to cyclones, coolers and a bag filtration plant. Approximately 100 per cent of zinc oxide was stated to have been recovered and prefabricated bungalows had been safely positioned on land adjoining the works.

* * *

CHEMICAL Safety Data Sheet SD-34 on Tetrachloroethane, designed for supervisory staffs and management, has just been published as the 34th in the series, by the Manufacturing Chemists' Association, 246 Woodward Building, Washington, D.C. The manual (20 cents) sets forth important physical and chemical properties, handling techniques, and recommends personal protective equipments. Health hazards and their control are also dealt with.

* * *

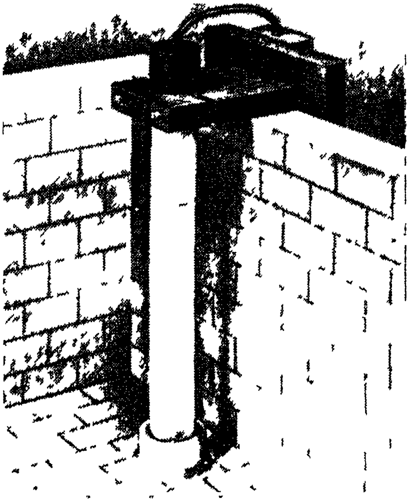
THE 1950 edition of "Physical Properties of Synthetic Organic Chemicals," has just been issued by the Carbide and Carbon Chemicals Corporation, New York. The 16-page booklet, designed as a condensed guide for users of organic chemicals, contains, in tabular form, data on applications and physical properties of more than 200 synthetic organic chemicals.

* * *

COMPLETE sets of the 21 reports and papers presented and discussed at the fourth International Gas Conference in London in June, and the official proceedings of the conference, are obtainable (3 gns. per set, post paid) from the secretary of The Institution of Gas Engineers, 1 Grosvenor Place, London, S.W.1.

* * *

ONE of the most comprehensive of recent reviews of current scientific (and other) literature associated with husbandry is the newly issued *Revue Internationale des Industries Agricoles.* This provides (in French) a great number of short summaries of the themes of recent publications in many countries and the essential information for those who wish to procure the originals.



[Courtesy, The Thermal Syndicate Ltd

The Vitreosil electric immersion heater

THERE are many instances, such as pickling liquors and those used in metal plating processes, where acid liquors can with advantage be heated electrically. For this purpose it is, of course, essential that the envelope of the electric heating unit should be acid-proof in addition to being a good insulator and unaffected by thermal shock. The Vitreosil (pure fused silica) electric immersion heater now available from The Thermal Syndicate, Ltd., Wallsend, Northumberland, incorporates a number of new features including fitting with a rubber seal and the marking of the minimum immersion depth by a safety line round the envelope; the outer surface of the heater is glazed facilitating cleaning, and giving greater resistance to chemical attack.

* * *

TIMELY warning of the dangers that attend the use of rubber solution in surfacing floors is given in the technical notes of the *F.P.A. Journal* (No. 7, October, 1949), issued by the FOC Fire Protection Association. A number of explosions have occurred due to the vapour given off by the solvents used in the rubber solution being drawn to a source of heat. The association also announces that it will be represented on stand No. 410, at the Building Exhibition at Olympia, London, next month.

· PERSONAL ·

RECOGNITION of his valuable work on research in essential oils is given to SIR JOHN SIMONSEN in *Chemical and Engineering News* (Vol. 27, October 10), on the occasion of his receiving, in Atlantic City, U.S.A., the Fritzche Award of the American Chemical Society. The journal's front cover shows a composite photograph of a portrait of Sir John, showing the gold medal behind him, and nearly a full page is given to biographical details of his career.

DR. JOSEPH ROTBLAT, senior lecturer in physics at Liverpool University, has been appointed to the chair of physics at the Medical College, of St. Bartholomew's Hospital, London. The doctor, who is a Pole, took a physics degree at Warsaw University and devoted his work to nuclear research. When only 26 years of age, he gained his D.Ph., and was appointed assistant director of a new laboratory of atomic physics. Although unable to speak English when he left Poland, within five months of his arrival in England he was lecturing to students at Liverpool University. The doctor was a member of Sir James Chadwick's team on atomic research both in this country and the U.S.A., and he is a consultant to the AERE, Harwell, and a member of the council of the Atomic Scientists' Association.

MR. GAVIN HAMILTON, general manager, lamp and glass works, British Thomson-Houston, Ltd., relinquishes next week his executive duties. MR. T. J. DAGLEY is to be general manager of the glass factories and of glass and lamp-component sales. MR. S. R. EADE will be manager of the lamp factories.

MR. E. R. L. FITZPAYNE, general manager, Glasgow Corporation Transport, has been appointed a member of the Oil Consumers Council. He succeeds Mr. Vance Morland, who has resigned on taking up a post with the Road Passenger Executive, British Transport Commission.

PROFESSOR WOLFGANG PAULI, colloid chemist and winner of the Nobel Prize in 1945, celebrated his 80th birthday in Zurich last month. A tribute was paid to his work in the September issue of the *Austrian Chemical Journal.*

DR. I. G. SLATER, formerly Director of Operational Research, Admiralty, has been appointed director of research and development of the aluminium division of Tube Investments, Ltd.

MR. CHARLES FREDERICK RATCLIFFE BROTHERTON, of Kirkham Abbey, Yorks., chairman of Brotherton and Co., Ltd., Leeds, left £917,676, net £861,647 (duty paid £579,419).

Fertiliser Team

THE Fertiliser Manufacturers' Association announced this week that the following comprise the fertilisers productivity team which sailed to-day (Saturday) in the liner *Queen Elizabeth* for a six weeks' survey of the U.S. industry:—

Leader: Mr. J. H. Smith (Fisons, Ltd., Goole); secretary, Mr. W. L. Nicol (Scottish Agricultural Iudustries, Ayr). Supervisory group: Mr. J. W. Bews (Scottish Agricultural Industries, Leith) and Mr. A. H. Hemington (Fisons, Ltd., Boston). Technicians. Mr. C. Akester (The Farmers' Company, Ltd., Barton-on-Humber), Mr. F. R. Cook and Mr. R. F. Miles (both Fisons, Ltd., Ipswich) and Dr. T. H. Henry (I.C.I., Ltd., Billingham). Workshop group: Mr. R. C. Bostock (Edward Webb & Sons (Stourbridge), Ltd.), Mr. J. Edwards (Scottish Agricultural Industries, Carnoustie), Mr. J. Thomas (Fisons, Ltd., Liverpool) and Mr. E. N. Woods (Fisons, Ltd., Avonmouth).

Obituary

The death has occurred at Helenlea, Shotts, Lanarkshire, of MR. ADAM BUCHANAN ALLISON, who recently retired as works manager of the Shotts Iron Company, Ltd., Shotts. He was 70. A member of the Iron and Steel Institute of Scotland, he was for a number of years a member of the Lanarkshire County Council.

The death occurred recently of MR. ALEXANDER O'BEIRNE, managing director of A. Cockburn and Co. (Engineers), Ltd., Glasgow. Mr. O'Beirne, who was 71, was joint founder of the company in 1907.

HOME

£100,000 for Steel

A £100,000 scheme for the re-organisation of the Ivor Works Foundry, Dowlais, near Merthyr Tydfil, was announced last week on behalf of Guest, Keen & Baldwin, Ltd.

Coal Production

Britain's output of deep-mined coal last week rose by 72,300 tons over the previous week. Comparative figures are: Last week, total 4,398,700 tons (4,152,700 tons deep-mined, 246,000 tons opencast). Previous week, total 4,342,700 tons (4,080,400 tons deep-mined, 262,300 tons opencast).

Soap Tablets

A novelty introduced at the Modern Homes Exhibition in Glasgow is a "soap-pill" designed to provide simple portable washing equipment. It is a non-caustic ration-free tablet, slightly larger than an aspirin and capable of giving a quick lather. At the Kelvin Hall exhibition 4000 tablets were sold in four hours.

Torry Research Station Damaged

Fire last week in the chemical section of the Torry Research Station, Aberdeen, destroyed the photographic department and severely damaged several other parts of the building. The research centre is in process of being doubled in size to meet the needs of the DSIR. It is the main British centre for research work on the preservation, handling, storage and processing of fish.

Whaling Expedition Sails

The 15,715-ton whaling factory ship *Balaena*, most scientifically equipped of its kind, which is to lead the 25 factory ships on the 1949-50 Antarctic whaling expedition of seven months, arrived in the Mersey last week from Norway. She stayed only to pick up 80 British members of her crew and special stores unobtainable in Norway, and left the following evening for the Antarctic.

Scientific Film Series

A series of films is to be shown by the London Scientific Film Society in the Royal Empire Society Hall, Northumberland Avenue, London, W.C.2 at 7.15 p.m. on the middle Wednesday of each month from October to March, 1950. The first exhibition was on October 19 and included "Nature of Plastics" (colour), "Heating Research for Houses," "Turbo Jet Propulsion," and "Atomisation."

Another Packaging Exhibition

Because of the success of the First National Packaging Exhibition, the Empire Hall, Olympia, has been booked for a second exhibition, to be held early in November next year. Several firms report that they took enough business in the first few days to absorb their entire production capacity for the coming year.

Spanish Production and Research

Bamag, Ltd., London, points out that the nitric acid plant being erected by Nitratos de Castilla in Valladolid, was designed, and drawings prepared, in London, and its engineers are at present carrying out the construction. The plant was not manufactured by Bamag-Meguin as reported by *Dyna* (1949, *24*, 315-322) and quoted in THE CHEMICAL AGE (*61*, 195-196).

"Shell" at Textile Exhibition

The work of several well-known artists, symbolising raw material used in the textile industry, was on view at Shell Chemicals' stand in the Textile Machinery and Accessories Exhibition, Manchester, which closed last week. The Shell stand, which was designed by Ian Jeffcott, L.R.I.B.A., showed samples of material treated with the company's products.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in August, include the following (in long tons):—Virgin aluminium: production 2571, imports 20,418. Secondary aluminium: production 4995. Aluminium scrap arisings: total 6770, consumption 6690. Aluminium fabrication: 16,173. Magnesium fabrication: 288.

Deferment for Textile Technologists

An agreement reached by the Textile Institute with the Ministry of Labour provides for deferment of call-up for national service of students intending to obtain professional qualifications in the textile industry. Temporary exemption is provided for students taking part-time or whole-time courses of study which lead to, or give exemption from, the Institute's examination in general textile technology. Students taking whole-time courses for university degrees, technical college diplomas, or other academic qualifications having the same effect, may also be deferred for the period of their whole-time studies.

OVERSEAS

Another Source of Isotopes

Norway's first atomic plant, to be constructed at Kjeller Aerodrome, near Oslo, which will supply isotopes for medical purposes, is expected to operate in 1951.

More Chilean Copper?

The management of the Chaquicamatta Copper Mine in Northern Chile intends to raise its production of the metal from 25 million to 30 million lb. monthly.

Manganese Exports to be Doubled

The Government of India proposes to double the export of manganese ore, one of India's main export items. Sixty per cent of the manganese ore produced in India comes from the Central Provinces, where the deposits are said to be the finest in the world.

India Admits Moulding Powder

The secretary of the All-India Plastic Manufacturers' Association, Bombay, states that the Government of India has agreed to the importation from soft currency areas of urea plastics moulding powders. The import licences would relate to the July-December, 1949, shipping period and would be subject to essentiality and a monetary ceiling.

U.S. Sulphur Production

Output of sulphur in the U.S.A. in July was 388,811 long tons and the total for the first seven months of the year of 2,772,284 long tons, was slightly lower than the same period of 1948. Apparent sales were calculated at 414,278 long tons, and stocks held by producers were 3,142,845 long tons, a decrease of 82,169 long tons since the beginning of the year.

U.S. Industries for Scotland?

Precision engineering and chemical engineering companies are among the firms which Sir Steven Bilsland, chairman of Scottish Industrial Estates, Ltd., and his colleagues of the Scottish Council (Development and Industry) hope to contact when in the U.S.A. and Canada. The deputation will meet interested industrialists there, to discuss the establishment of other American factories in Scotland. To avoid competition with established companies and to broaden the basis of Scottish industrial economy efforts will be directed to attract industries not yet fully represented in Scotland. Opinion in Scotland favours development of scientific instrument production, already started by U.S. firms.

German Industrial Revival

The U.S. Standard Oil Company is reported to be backing a large financial undertaking to rebuild oil storage tanks in Western Germany.

French Fluorite

Exploitation of fluorite in the Sauces seam, which was interrupted by the war, has just been resumed. It is stated to yield a minimum of 85 per cent F^2Ca and is therefore very good quality. By selection, even better quality is obtained.

German Bid Lowest

Because the German tender was the lowest and offered the quickest delivery, the contract for a 100-ton floating crane for Oslo, to cost about £75,000, has been given to the Lubecker Maschinenbau Company, Lubeck.

Future of Burma's Oil

The Burmese Government and the British-owned Burmah Oil Company are discussing proposed joint working of Burma's oil industry, the company's headquarters in Rangoon announced last week. Consideration of oilfield workers' demands on employment terms have been suspended during the talks.

More Coal from Britain?

Three representatives of the National Coal Board have lately been having discussions, in Norway, with Norwegian importers. In Oslo, writes the newspaper *Norges Handelsog Sjöfartstidende*, it is supposed that the visit represents an effort by the NCB to regain some of the markets which British exporters used to serve in the Scandinavian countries before Polish coal became a serious competitor in the 1930's. As Poland has not devalued, its exports are now rather more expensive in Norwegian currency.

Developing French African Oil

A company to explore and exploit oil resources of French Equatorial Africa has been established recently in Port-Gentil (Gaboon) with a share capital in local currency equal to Fr. 1550 million. The French Government and the Colonial Government are reported to have taken up over 80 per cent of the share capital, chiefly through the Bureau de Récherches des Pétroles. The balance has been taken up by the private oil companies, the Compagnie Française des Pétroles and the Rociéte de Récherches Minières et Pétrolières Coloniales.

GERMAN BIDS TO AVERT DISMANTLING

Chemical Production Resumes Its Advance

CHEMICAL production in Western Germany has resumed the advance which was interrupted during the summer by seasonal and market factors, but smaller firms are still complaining that they find it impossible to compete with products imported under ERP auspices. In the important industrial area of North Rhine-Westphalia, which includes the Ruhr, chemical production is recorded to have regained the 1936 level, which is regarded as a pre-war standard year. In this region chemical production is now one-fifth higher than it was at the end of last year.

The controversy over dismantling has entered a new and—from the German viewpoint—perhaps more promising phase. The Federal Government is working on proposals for the substitution of alternative plant and machinery for works on the dismantling list which German interests consider essential for the national economy. As far as the Fischer-Tropsch plants are concerned, the Government experts are proposing voluntary surrender of equipment specific to the synthetic oil process combined with a request for other equipment to be left in the works. Similarly, it will be suggested by the Federal authorities that the hydrogenation plants are to be adapted in such a way as to exclude the possibilities of their use for synthetic operations under high pressure: and if this suggestion is turned down, an alternative proposal is said to be ready for submission to the High Commissioners.

Idle Plants

The order that dismantling of the synthetic rubber installations at Farbenfabriken Bayer in Leverkusen was to begin on October 24 was received with the usual disapproval, but in fact these installations have been idle for some time. German interests would like to retain synthetic rubber manufacturing capacity for those grades which are technically superior to natural rubber.

The inter-zonal trade agreement, reached after great difficulties, provides for chemical deliveries from Western Germany to the Soviet zone totalling DM 30 million and chemical deliveries in the opposite direction of DM 21 million. Half the western exports will consist of dyes and pharmaceuticals; coal-tar, soda, naphthalene, barium carbonate and insecticides are also important on the list of chemicals which the eastern zone wishes to buy from the west. In return, the Soviet zone is to supply sulphur, photographic film, pharmaceuticals and crude kainite, but considerable doubt exists on both sides as to the extent to which the agreement will, in fact, be carried out.

Trade agreements have also been concluded by Western Germany with Austria and Italy. Western Germany will send another $3 million worth of chemicals to Italy by July 31, 1950.

Industrial Reorganisation

The two former I.G. Farbenindustrie plants at Leverkusen and Hoechst have now completely separated their selling organisations for pharmaceutical products and are marketing these under the brand names of Bayer and Hoechst.

Badische Anilin- und Sodafabrik, Ludwigshafen, hopes to supply 110,000 tons (N) of fertilisers to German agriculture in 1949/50 and intends to increase its output further if dismantling at Oppau is discontinued.

The manufacture of sodium tripolyphosphate has been resumed by Chemische Werke Albert at Wiesbaden-Biebrich. The company is also offering a new timber preservative on a fluor-ammonium basis. Rheinische Kunsteide A.G., Krefeld, hopes to return to full-capacity operations in its rayon section by the end of this year. Other artificial fibre plants of the company are already in full operation.

Important prospects attach to the knowledge gained about the pertoleum deposits in the Emsland district near the Dutch frontier, in the central part of Lower Saxony, and near Hamburg. The total underground reserves are now estimated at about 20 million tons, compared with 10.6 million tons in 1947. High hopes are being entertained for a new oilfield discovered north-west of Lingen, where a deposit 5 km. long and 2 km. wide is supposed to exist. Latest prospecting suggests that this deposit may extend over a length of 10 km. The German crude oil output declined slightly in September to less than 75,000 tons, but the 1949 production is expected to exceed 800,000 tons, compared with 628,000 tons in 1948. By 1952 an increase to 1.5 million tons is anticipated, provided modern drilling equipment can be secured.

Next Week's Events

TUESDAY, NOVEMBER 1

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. H. Silman and Dorothy Wernick: "Electrodeposits as Bases for Paints."

Institute of Physics

Dundee: University College, 4.30 p.m. (Scottish Branch). Prof. P. I. Dee (Glasgow University): "Recent Advances in Nuclear Physics."

WEDNESDAY, NOVEMBER 2

The Chemical Society

Dublin: University College, 7.45 p.m. J. G. Belton: "Some Biologically Active Phenazine Derivatives."

Scientific Instrument Manufacturers' Association

London: 8-11 Queen Square, W.C.1, 2.30 p.m. Electronics Symposium, official opening by Sir George Thompson. (Thursday, November 3 and Friday, November 4, 10 a.m. to 5 p.m., technical papers).

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 6.45 p.m. Papers on "Some Recent Advances in Water Examination," followed by discussion.

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. E. V. Beatson: "The Joining of Coated Metals."

Manchester Literary and Philosophical Society (Social Philosophy Section)

Manchester: Portico Library, Mosley Street, 5.30 p.m. Dr. F. D. Wilkins (Principal Director of Scientific Research (Development), Ministry of Supply): "Freedom and the Management of the Scientist."

Royal Society of Arts

London: John Adam Street, W.C.2, 2.30 p.m. Inaugural address. Ernest W. Goodale (chairman): "The State, the Society and Industry."

THURSDAY, NOVEMBER 3

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.15 p.m. Reading of original papers.

Bristol: University, 7 p.m. (Joint meeting with the RIC and SCI). Prof. C. A. Coulson: "What is a Chemical Bond?

Sheffield: University, 5.30 p.m. (Joint meeting with the Sheffield University Chemical Society). Dr. C. W. Suckling: "Some Aspects of the Organic Chemistry of Fluorine."

The Royal Institute of Chemistry

Brighton: Technical College, 6.30 p.m. N. Booth: "Careers for Chemists." First of four meetings for students and senior school children. Brains Trust.

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. T. B. Grimley: "Contact Between a Solid and an Electrolyte"; J. R. Whitehead: "Surface Deformation and Friction of Metals at Light Loads."

The Textile Institute

Manchester: 16 St. Mary's Parsonage, 7.15 p.m. W. P. Hazeldine and L. Klein: "Textile Trade Wastes and their Treatment."

FRIDAY, NOVEMBER 4

Society of Chemical Industry

Reading: University, 5.30 p.m. (Joint meeting of the London Section with the Food and Agricultural Groups and the RIC). Dr. J. B. M. Coppock (director, British Baking Industries Research Association): "Some Present Trends in Bakery Research." Preceded at 2.30 p.m. by visit to a biscuit factory.

Royal Statistical Society

London: 2 Savoy Hill, W.C.2, 6 p.m. Symposium on "The Repeatability and Reproducability of Test Results." Speakers: R. Claxton (National Benzol Association); A. H. Dodd (Newton, Chambers, Ltd.); J. R. Fraser (Government Laboratory); R. G. Newton (Rubber Producers' Research Association); and A. E. Worley (Reckitt and Colman, Ltd.)

SATURDAY, NOVEMBER 5

Institute of Physics

Swansea: University College, 2 p.m. (South Wales Branch). Dr. F. C. Toy (president): "Some Applications of Classical Physics in the Textile Industry."

Modern Building Technique

The International Building Trades Exhibition, which is to open at Olympia on November 17, is supported by some 30 firms, whose products are, directly or indirectly of interest to the chemical engineer and manufacturer. The ventilation of buildings, glazed partitioning for office use, and hot dip galvanising for gutters and other fittings are among the supplies to be shown, and for which recent improvements are claimed by G. A. Harvey & Co. (London), Ltd.

CHINA'S MINERAL WEALTH

Vast Resources Await Development

ONE of the effects of the civil conflict which has for years been disrupting China, has been to deprive the world of an enormous reservoir of mineral wealth, which has never been fully exploited.

Some of the occurrences of the wide range of minerals are described in this article, which is abstracted from *The South African Mining and Engineering Journal* (60, part II, 99 and 101).

China's anthracite deposits are estimated to exceed 400,000 million tons. Possibly much coal classed as anthracite in China may turn out to be semi-bituminous or high-grade bituminous coal, but, at all events, the coal reserves can aptly be described as inexhaustible.

Coal is found in practically every province, the principal producing areas being the Chihili-Tanshan and the Kiangsi-Pingshiang regions. In some areas mining is primitive and the coal is carried long distances on donkey or camel back to the nearest markets. Some important collieries are purely Chinese concerns, managed and engineered entirely by Chinese.

Iron is found along the Yangtze valley, but the major producing districts are the Hupeh-Tayeh and Manchurian-Penchihu regions. In the range of hills north of the Sancung Railway iron ore is found in contact with diorite and chalk and has been smelted since ancient times.

Pure Iron Ore

The iron ore of Tientsin in the Shantung Province is stated to be the purest obtainable in the world. Engineers have estimated the deposit to contain 49 million tons of ore, of which 20 million can be easily mined. It was developed for a number of years by the Germans, who were eventually supplanted by the Japanese.

Both limonite and hematite are found throughout the Shansi Province. The deposits are not extensive and occur in layers ranging from a few inches to 3 ft. in thickness. In the Szechwan Province these ores are smelted with an average extraction of 45 per cent, charcoal being used for fuel and limestone as flux.

In 1923, which was probably the peak year, about 800,000 tons of hematite were mined. China's most important iron mines are situated at Tayeh, in the Hupeh Province, 15 miles from the Yangtze river.

The bulk of the world's antimony production at one time came from China, her contribution in 1937 being 14,702 tons out of a total of 38,600 tons. The metal came mainly from Changsha in Hunan Province.

China is also the world's largest producer of salt, the output for 1937 (including Manchuria) being estimated at 3 million tons. Mineral salt is found in the Yunnan Province, the principal producing district, the most important salt well being in Weiyan.

Copper

At Malipa and Tungchwan in Yunnan copper was mined to supply China and Burma with their requirements for currency and other needs. The copper is found native in thin laminæ, while the mines produce malachite and azurite.

One of the richest mineralised zones in the world is the Chienchang valley in the Szechwan Province, where alluvial gold is found in all the rivers. Oxidised lodes are worked by primitive methods, the sulphides being discarded on account of their refractoriness.

At the Shuikowshan mine in Hunan lead has been worked for 200 years by primitive methods. In 1896 a shaft was sunk to 300 ft. and in 1916 a second shaft and a new plant were completed. The ore is a mixture of galenite, sphalerite and pyrite and carries lead up to 33 per cent, zinc up to 29.40 per cent and silver up to 21.2 per cent.

Arsenic is produced in Hunan as a by-product from the treatment of tin ore carrying phyrrhotite, while an extensive deposit of realgar (arsenic bisulphide) is found near Tzeil in Northern Hunan.

In the southern part of Hunan are tinfields which have been worked for many years. The most interesting occurrence is at Tchanghsien where a dyke of granite has penetrated the limestone; along the course of this dyke are found true pipes of tin ore, associated with pyrrhotite and other minerals. The pipes are roughly circular and have diameters up to 20 ft., the maximum depth reached being about 400 ft.

Other minerals are known to occur in China to a limited extent.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DELMARCO, LTD., Leigh (Lancs.), detergents and manufacturers agents. (M., 29/10/49.) September 29, £2500 to Askford Finance Co., Ltd.; general charge.

Company News

Laporte Chemicals, Ltd.

The directors announce the intention to pay an interim dividend of 2¾ per cent on December 1.

Increases of Capital

The following increases in capital have been announced: FISONS, LTD., from £7,000,000 to £8,500,000. XZIT (G.B.), LTD., from £4000 to £30,000.

New Registrations

F. & R. M. Harris (Birmingham), Ltd.

Private company. (473,960). Registered October 15. Capital £2000. Consulting chemical engineers and manufacturers and suppliers of chemical plant and equipment, etc. Directors: F. Harris and M. Harris. Reg. office: 17-18 Doe Street, Birmingham.

W. Gwennap (Agricultural), Ltd.

Private company. (474,020). Capital £15000. Chemical engineers, horticultural and agricultural manufacturing chemists, etc. Directors: W. Gwennap, F. J. Williams. Reg. office: 55 Wolverhampton Road, Stafford.

Northern Analysts, Ltd.

Private company (474,011). Registered October 17. Capital £1000. Objects: To acquire the business of consulting analysts carried on by E. Chapman and J. R. Hunecke at 7 Lowgate, Hull. Directors: E. Chapman, J. R. Hunecke. Solicitors: Drury and Taylor, Goole.

ELECTRONIC INSTRUMENTS

Uses in Industry and Research

THE increasing and varied uses of electronic instruments and their application to industry, education and scientific research, will be the subject of a three-day symposium in London next week.

Sir George Thompson will officially open the symposium at 2.30 p.m. on Wednesday, November 2, in the examination Hall, 8-11 Queen Square, W.C.2, and the first paper will be by Denis Taylor (AERE, Harwell), who will discuss electronic instrumentation in relation both to measurement and control in atomic research.

Electronic and magnetic amplifiers will be the subject of papers by I. L. Banks and A. V. Hemingway respectively at the morning session on Thursday, November 3.

At the final session of the symposium (November 4), which is organised by the electronics group of the Scientific Instrument Manufacturers' Association, P. H. Briggs will speak on "An Industrial Electronics Servo Mechanism," and A. J. Maddock will cover the co-operative research at the British Scientific Instruments Research Association.

No Shortage of Resins

THE Wood Committee of the OEEC has just completed a five-day session at Geneva, during which the representatives of 16 countries examined the question of natural resin supplies in Europe. It was concluded that European exporting countries would be able to sell all available resins abroad in 1949 and importing countries would be able to satisfy almost the whole of their needs. The committee also concluded that, if current provisions are carried out, there is unlikely to be a shortage in 1950.

The committee stressed that an important modification in Europe's resin situation might result when the exceptional losses resulting from the French forest fires were felt, and that it was therefore still important to increase exportable quantities of resin in 1951 and after. Negotiations with various countries have begun to enable France to dispose of her present surplus resins.

The committee also considered the possibility of obtaining future supplies of resins from Brazil and asked for further information on the subject.

Chemical and Allied Stocks and Shares

MOVEMENTS in stock markets this week have been in sharp contrast to those of a week ago, when prices were marked down on a wide front in anticipation of drastic measures to deal with problems arising from devaluation of the £ and the danger of inflation.

The rally this week was due mainly to the fact that Mr. Attlee's measures do not include a capital gains tax nor an increase in the stamp duty on Stock Exchange transactions. Both had been widely rumoured. It is realised, however, that the Government's proposals are by no means drastic enough and that unless there is a very big expansion in export trade, present probelms have not been solved.

Shares of chemical and allied companies, expectedly, have moved closely with the general trend, falling sharply towards the end of last week, and rallying again this week. Imperial Chemical, which had been down to close on 42s. have recovered to 43s. at the time of writing. Lever & Unilever, after being below 41s. recovered to 41s. 9d., United Molasses were 38s., after being below 37s., Courtalds 34s. 3d. after 33s. 3d., while British Celanese firmed up to 16s. 7½d.

Calico Printers are 21s. 6d. at the time of writing due to financial results and the raising of the dividend from 5 to 8 per cent in celebration of the company's jubilee. Glaxo Laboratories recovered from 18¼ to 18⅝. Turner & Newall were better at 75s. 4½d., British Oxygen 92s. 6d. and Dunlop Rubber rallied from 59s. 9d. to 61s.

Monsanto Chemicals have been steady at 51s. 3d., Fisons 27s., Albright & Wilsons firm at 30s. and Brotherton 10s. shares again 20s., F. W. Berk 2s. 6d. shares 13s., Bowman Chemical 6s. 9d. and Amber Chemical 2s. shares 5s. 3d. Pest Control 5s. shares were 8s. 4½d., L. B. Holliday 4½ per cent preference 20s. 3d. and British Chemical & Biologicals 4 per cent preference 18s. 9d. Boake Roberts 5s. shares eased to 28s.

British Xylonite strengthened to 68s. 9d. after an earlier decline, British Industrial Plastics 2s. shares were 4s. 7½d., De La Rue 20s. 6d., and British Glues & Chemicals 4s. shares 18s. Steadiness at 22s. 4½d. was shown by General Refractories and, elsewhere, Ilford were firm at 22s.

Amalgamated Metal shares at 17s. 9d. were unaffected by the pending re-opening of the London Metal Exchange for free dealings in tin. Electrical equipment shares also made some recovery from earlier losses, G.E.C. being 74s. 6d. and Crompton Parkinson 22s. 6d.

Iron and steels were better, but earlier declines were only partly regained. United Steel improved to 25s. 3d., Stewarts & Lloyds to 53s., Guest Keen to 38s. 9d., while elsewhere, Powell Duffryn were 26s. 6d. and Staveley 78s.

Boots Drug were better at 49s. 6d. despite the change for national health prescriptions, Sangers also improved to 21s. 6d., and Beechams deferred to 12s. 6d. British Drug Houses 5s. shares were 6s. 6d.

The higher oil prices helped oil shares. Shell moved up to 66s. 3d. Anglo-Iranian recovered to £7, and Trinidad Leaseholds to 23s. 9d. The rally in industrials earlier in the week is expected to give way to quieter conditions in stock markets now the position can be more clearly assessed.

Industrial Casualties

THE number of reported deaths from industrial accidents in the United Kingdom in August was 137, a decrease of six compared with the previous month, but 29 more than the revised figure for August, 1948.

In chemicals, oils and soaps, etc., there were nine deaths, according to the *Ministry of Labour Gazette* for September (*57*, 329), while six occurred in metal conversion, but none was reported in other metal trades.

The total number of cases reported under the Acts, numbered 27, as follows:—Aniline poisoning, five; anthrax, five; epitheliomatous ulceration (skin cancer) 14 (pitch, seven; tar, three: oil, four); chrome ulceration (chromium plating) three.

Rumanian State Trading

A list of State import and export companies, operated by the Rumanian Ministry of Foreign Trade is published in the *Board of Trade Journal, October* 22.

Among companies of interest to the chemical and allied industries is Romano-Export, which is partly concerned with the import of chemicals, drugs, laboratory equipment, minerals, etc. Petrol-Export sells petroleum and petroleum products and imports oil plant.

Prices of British Chemical Products

Good Export Demand for Sodium Chemicals

A SUSTAINED demand characterises most sections of the industrial chemicals market and, while there have been few price changes of any importance, the undertone of the market is firm. The movement of supplies to the textile and dyeing industries has continued on a fair scale, mainly against existing contracts, while some expansion in demand from the plastics industry is reported. There have been further adjustments in the convention quotations of white lead and red lead as a result of the change in the price of the metal. The latest basis price for dry white lead is £131 5s. per ton and for red lead £123 per ton. United Kingdom exports of chemicals, drugs, dyes and colours during September were above the average for the quarter and, judging by the volume of overseas inquiry in circulation at the present time, the figures for the current month should show even further improvement. There is an active demand for caustic soda and sodium chlorate and the soda products generally. The potash chemicals continue in strong request. Formaldehyde, hydrogen peroxide and white powdered arsenic are other items being taken up in fair quantities. Conditions remain unchanged on the coal tar products market and home trade in most products is only moderate.

MANCHESTER.—Chemical traders on the Manchester market during the past week reported a steady flow of delivery specifications against bookings in caustic soda, soda ash and most other alkalis. The general run of potash compounds are also in steady request, with a fairly satisfactory movement of supplies of the ammonia and magnesia chemicals. Fresh inquiries for both home and export buyers have also been dealt with. In the market for the by-products dull conditions continue to rule in a number of the heavy sections, but for the benzols, xylols and most of the light distillates the demand during the past week has been steady.

GLASGOW.—The Scottish chemical market has been fairly steady, but there is no doubt that devaluation is affecting business in general. The export market has so far not shown the expected improvement.

Price Changes

Rises: Borax, boracic acid, cobalt oxide, copper chloride, copper nitrate, red lead, white lead, zinc oxide, carbolic acid.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.— Ton lots, d/d, £101 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d, to 3s. 3½d. per lb.

Arsenic.—Per ton, £36, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags, commercial, granular, £36; crystal, £38; powder, £39; extra fine powder, £40; B.P., granular, £45; crystal, £47-£48; powder, £48-£48 10s.; extra fine powder, £49-£49 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £64 10s.; crystal, £70; powder, £67 10s.; extra fine powder, £69 10s.; B.P., granular, £76 10s.-£79 15s.; crystal, £82; powder, £79 10s.-£81 15s.; extra fine powder, £81 10s.-£83 15s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 9½d. per lb.

Copper Sulphate.—£36 5s. per ton f.o.b., less 2%, in 2-cwt. bags. (Nominal.)

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £123; orange lead, £135. Ground in oil: red, £144; orange, £156.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £131 5s. per ton. Ground in oil, English, under two tons, £149 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£103 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅜d. per lb.; ground, 10⅜d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £81 10s.; green seal, £80 10s.; red seal, £79.

Zinc Sulphate.—Nominal.

WILKINSON
CHEMICALS

HYDROFLUORIC ACID

ANHYDROUS AND SOLUTIONS ALL STRENGTHS ALSO PURE REDISTILLED 40%w/w

FLUORIDES, Neutral

Sodium, Magnesium, Barium, Potassium Lead Zinc, Ammonium, Aluminium, Lithium, Chromium

SILICOFLUORIDES

Magnesium, Zinc, Ammonium, Barium, Potassium Lead, Hydrofluosilicic Acid

BOROFLUORIDES

Sodium, Potassium Ammonium, Lead, Copper, Zinc, Cadmium Fluoboric Acid Solution.

BiFLUORIDES (ACID)

Ammonium, Sodium, Potassium

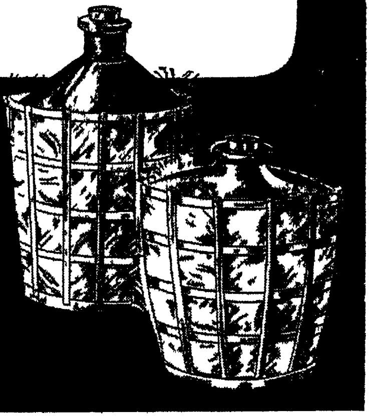
DOUBLE FLUORIDES (Cryolites)

Sodium HexafluoAluminate Potassium HexafluoAluminate

● *OTHER FLUORIDES TO SPECIFICATIONS*

GLASS ETCHING ACIDS

AMMONIA WHITE ACID and VITROGRAPHINE



Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached. £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in October, £10 0s. 6d., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 11s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2 raised from £10 8s. 6d. to £10 18s. per ton, due to increase in potash content, as notified in new Board of Trade Order.

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p-**Cresol** 34/35° C.—Nominal.

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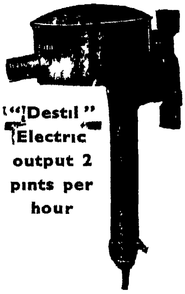

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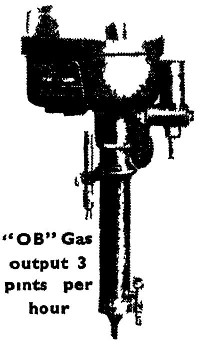

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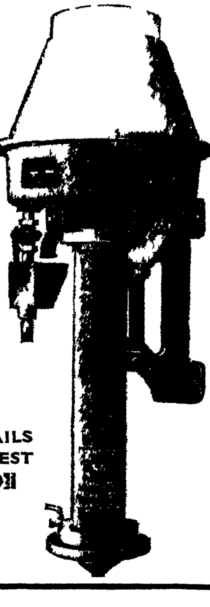

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Producers and Politicians

THERE was a time, comfortably within the memory range of most of us, when politics and industry occupied each its own well-defined sphere and when devotion to one did not necessarily involve any serious interest in the other. It is evident now that all that belongs to the past and that anyone today who makes chemicals or steel, refines sugar or fabricates one or other of the myriad goods for which raw materials are allocated or end products officially rationed will be brought into so intimate a contact—or collision—with the Administration that non-partisanship becomes an impossibility. That states the situation at its lowest level. If the reactions between industrialists and politicians meant no more than the addition of a few more Board of Trade and equivalent forms to fill, many in industry would still preserve the neutrality, in their commercial capacities. That philosophy has served very well and long a class which was satisfied that its purpose in life was to make goods and profits—not to make or unmake politicians.

The challenge which has robbed a large section of producers in this country of their status as neutrals in politics is one which has sought to represent profit making as disreputable, and seems bent on withdrawing in widening fields of industry the right to make goods at all. The victim who failed to show resentment of a direct attack of the latter kind would need to be pusillanimous beyond belief, certainly not of the kind which successfully directs large industries through times of uncommon risk and difficulty.

Those are some of more obvious reasons for the regrettable fact that politics in one form or another receives far more attention than ever before in all the familiar publications put out by commercial and industrial groups, company chairmen and federations, and has given rise to a revival of the old art of pamphleteering. The growing number of speakers and writers inside industry who are taking to this unfamiliar line of country cannot be blamed for this diversion, notwithstanding the expenditure of effort which is necessarily involved in ways which produce nothing tangible, much less anything that might reduce our dollar shortage. The cobbler, in this instance, would very contentedly have stuck to his last but for the imminent prospect that the last itself would be compulsorily acquired or rendered unrecognisable if he did not busy himself in its defence.

An arresting result of all such alarms has been the exceptional increase in

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the past week or so of the number of organisations which have been provoked by signs of mismanagement of national affairs closely concerning them to appeal to public opinion in terms more vigorous than they have used before. The Federation of British Industries and the National Union of Manufacturers, both of which have a considerable support from the larger chemical undertakings, have shown that they can be most effective propagandists when need is as urgent as it appears now. The NUM is all the better equipped to make national appeals, not wholly to manufacturers, by having as its president a politician, and one with a special gift for the trenchant presentation of the case for the "industrial opposition." Sir Patrick Hannon last week told 600 manufacturers attending the annual general meeting of the union:—

"The stark fact is that industry now has to shoulder the whole burden of extricating Britain from her serious economic difficulties without the encouragement and assistance which it might rightly expect to help it in its colossal task. I should like to make it clear that by industry I mean every living soul engaged in it in whatever capacity. Therefore, we who are responsible for the direction of industry have a clear and unchallengeable right to a voice in industrial affairs. Industry must demand that the Government cease their wasteful and dangerous experiment of trying to make the harsh and unyielding facts of our economic life fit narrow, sectional political theories." Industry, he added, had been far too complacent in its law-abiding compliance with edicts and directions with which they profoundly disagreed. Briefly, he said, the situation was this:—

"Industry has become weary of two things. First, it is no longer prepared to accept, as only it can, the full weight of responsibility for our industrial recovery without having some substantial share in deciding the conditions under which it shall operate. Second, it is equally weary of mere exhortation, without constructive suggestion and action, as well as incentive, to enable it to make its maximum contribution to the national well-being."

Sir Patrick Hannon, the Tory member for Moseley, Birmingham, is doubtless not altogether a disinterested witness. Yet it is scarcely a coincidence that many shades of opinion in industry are saying the same thing with equal emphasis.

Notes and Comments

Petroleum Possibilities

THE arresting view that Great Britain is capable of becoming a serious rival in the world markets for petroleum outside the U.S.A. is being advanced in Washington by no less an authority than the American National Petroleum Council. Exaggerated as that may appear in the light of our own modest estimates of supplies of British petroleum products in the next few years, this estimate of the situation is supported by some relevant and—from our point of view—heartening facts. As long ago as June last year, 40 per cent of world reserves of crude oil were stated by the Petroleum Information Bureau to be in the Middle East. " Unless a way can be found through agreement with the British Government of converting enough sterling into dollars to lower production costs, American overseas producers may have to curtail operations drastically," forecasts the *New York Times*. The view is, of course, by no means unanimous. Despite the large petroleum projects and new plant being developed here, the yield from these cannot, according to the view expressed in the *Chemical and Engineering News* (27, 2982), be treated as a net reduction of this country's dollar deficit. The new products will not all take the place of finished solvents now imported for dollars, and there is a dollar element in the cost of raw materials. Another aspect of the dollar element was the ECA grant, just announced, of $9 million for U.S. oil plant for Grangemouth.

" Rationalisation "

AWARENESS by those who are putting into effect the policy of the Anglo-American Productivity Council that little is to be gained and much may be lost by undiscriminating imitation of U.S. practices has been a reassuring feature of the first of the reports—on iron and steel—and is apparent again in the productivity report, " Simplification in Industry." The latter, which the council has distributed this week, records the findings and some practical comments of a group of six—manufacturers and representatives of the British Standards Institution, the Federation of British Industries and the Ministry of Supply standardisation committee—which has intimately studied, here and in America, the factors which have made possible the classical examples of mass-production there. Results of intense specialisation and long runs, not merely in engineering products but in such industries as aluminium extruding, steel, and paint, varnish and lacquer, are shown to have brought very large savings both to the industries and to vast numbers of American consumers. The case for adoption of identical policies here is weakened, as the report evidently recognises, by the fact, among others, that the U.S.A. provides most of its own markets, and the overseas buyers, taking little more than 5 per cent of total production, are mostly educated to like the standard American product. This report does, however, leave no doubt in the mind that the extremely keen prices which U.S. industries have generally offered since the war owes as much to the practice of concentrating on narrow product ranges as to anything else. The need to combine a big increase of U.K. production with the best profit margin that can be secured gives this report an unmistakeable topical interest, regardless of some inevitable objections to borrowing the customs of a very different economy.

Know How

ONE of the good principles noticed in this report, whose adoption here could bring rewards to outweigh the conventional objections, is the widespread American custom of what used to be dubbed " telling the world." This productivity group was satisfied that " generally, manufacturers in the U.S.A. are willing to have their work and its results widely publicised. This in itself is deemed to be an important factor in the development of high productivity and low cost." That engaging habit—which is, of course, not quite as devoid of reserves as some of the literature may suggest—receives testimonials every week in the U.S. technical Press in the form of commercial and technical explanations by principals, framed in more intimate terms than even shareholders here are privileged to hear. In that respect American industries have shed one of the shibboleths which some here tend still to preserve, illogically, with almost religious zeal.

Commonsense and Chemistry

THE troubles in which a general purpose Government department is almost bound to become involved when it deals with a subject which is peculiarly within the sphere of the analytical chemist have been exemplified by the amendment of the Motor Spirit (Regulation) Act, 1948. The object of that is, broadly, to establish that in legal parlance, at any rate, "diphenylamine" shall include not only the parent chemical but also compounds "of the same basic structure." The question of the nuclear-substituted diphenylamines being indistinguishable from diphenylamine itself would appear to be as irrelevant as most of the other contributions in the House of Commons to this chemical debate. Commonsense might well have compensated for the absence of chemical knowledge. No one seems to have questioned the probability of anyone deliberately doping his motor fuel with one of the other comparatively rare compounds analytically resembling diphenylamine—in order, presumably, to render himself liable to prosecution.

Conspirators' Day

AS if to rebut the criticism that the Ministry of Supply departments concerned with atomic energy have robbed the R.N. of its ancient distinction as "the silent Service," the authorities responsible for the great enterprise in Cumberland—the Windscale Works, Sellafield, which is reported to have been out of bounds to all but a chosen few since work began there—are going to a good deal of trouble to dispel the "top secret" aura which has grown up there. They are very busy just now putting finishing touches to a local atomic energy exhibition—but not, however, within the forbidden territory. This representation of some of the practical possibilities of nuclear physics has been set up in the innocuous surroundings of the Drill Hall, Whitehaven. "The object of the exhibition," says a note from the Ministry, "is to give the people of Cumberland the opportunity of learning something about the work of the great establishment which is being constructed in their midst and to understand something of the aims of Government atomic research." The faintly sinister flavour which seems—quite illogically—to cling to that bidding to a housewarming is not relieved by the day chosen. The exhibition opens to the public on November the Fifth.

Atomic Deadlock

THE moral responsibility of Britain to take the lead in utilising atomic science for good social purposes is the theme of an article by A. Litherland in the October issue of *Atomic Scientists' News*, journal of the Atomic Scientists' Association. Recalling that more than half the world's population is short of the necessities of life, the author urges acceptance of Lord Boyd Orr's plea—that this problem should be attacked immediately, "with the same drive and determination that we put into the horrid business of war." This would demand all available resources for a long period of years.

The struggle between East and West for armed predominance, he was convinced, served only to create an increasingly dangerous situation, and stock-piling of atomic weapons was capable of provoking an attack.

"Friendship and understanding are impossible across a barrier of competitive power, for you cannot shake hands with your left hand while you hold out an atom bomb in your right," Mr. Litherland maintains. There was a simple choice: power politics or world prosperity. The world could not afford both.

Neglected Chemical Sources

Failure to Convert Britain's Potential Raw Materials

WITH a dollar crisis threatening the livelihood of the whole nation, the need for making the best possible use of British raw materials in industry, rather than import them from dollar or hard currency countries, has become a matter of vital importance. This was the theme of a talk given by Dr. Jan F. Straatman to members of the Manchester Literary and Philosophical Society (Chemical Section) last week (October 26).

In an interview with Dr. Straatman after the meeting, THE CHEMICAL AGE was given a number of interesting indications of ways by which British chemical industry could save dollars, using available British raw materials.

Reducing Supplies

"We have all heard," said Dr. Straatman, "that imports from dollar or dollar-equivalent countries are to be cut from $1600 million to $1200 million—a cut of 25 per cent—and, as foodstuffs cannot be cut too much, a lot will have to be cut from raw materials. The question of British raw materials for British chemical industries is, therefore, growing in importance. We have all seen it coming a long time and we need have no doubt that the subject has been considered in high quarters for a long time."

Dr. Straatman, who is a consultant on industrial matters to a number of foreign Governments, went on to give figures of British raw material production compared with Continental countries, starting with the plastics group—phenoplasts, aminoplasts, vinylic, cellulosic and the others.

"For vinylic plastics the position in this country is very good," he said, "because all the raw materials are British and in 1947 Britain produced 6500 tons of vinylic plastics and expects to produce by 1952/53, 33,500 tons." The figures quoted were the official OEEC totals, he added.

"If we compare this with the whole of Western European production we see that in 1947 Britain produced 32.6 per cent of the vinylic plastics of Western Europe and by 1952/53 she will produce 33.4 per cent. Because all the materials are British, this country is holding its own and the same applies to aminoplasts—the British percentage in 1947 was 53 per cent and in 1952/53 will be 52.7 per cent—but if the raw material is not exclusively British the position is reversed, as in the case of phenoplasts," said Dr. Straatman.

"British production of phenoplasts in 1947 was 24,700 tons, which was 58 per cent of Western European production. By 1952/53 British production is expected to be 45,000 tons, only 43 per cent of Western European production. The cause of this is that British phenol production is too small.

Scarcity Forecast

"An immense amount of phenol has to be imported from the United States because we do not make synthetic phenol in this country in any appreciable quantities, and when imports have to be cut and production of phenoplasts has to go up, we shall see the very bitter consequences," he said.

The position in cellulosic plastics was equally bad, or worse. In 1047, British production was 27.3 per cent of Western European, but it would be dropping to 18.2 per cent in 1952/53. "Cellulose is one of the things this country practically does not produce, and important branches of the chemical industry have to use it in steadily increasing quantities," said Dr. Straatman.

"Before leaving the subject of plastics, let us look at the fifth group, among which is polythene. There again, British production was 41.9 per cent in 1947 and the expectation is that it will stay at 41.2 per cent in 1952/53," he added.

Straw Disregarded

Cellulose, however, was one of the "sore points." Continental countries were manufacturing cellulose for plastics, rayon production, for viscose, and for paper, in very large quantities from wood, beech wood especially, and from straw. "I should like to draw attention to the most remarkable position of straw. The British crop, as a rule, is about two-and-a-half times as much as the crop in Holland. At the moment, Holland uses about 550,000 tons of straw for chemical purposes—for straw board, paper, viscose and plastics; the consumption of straw in Britain for these purposes at the moment is 78,000 tons. And the remarkable thing about it is that the production of cellulose from straw in this country is going down and down."

Dr. Straatman said that during the war

(before 1941) there was practically no consumption of straw for chemical purposes, but in 1941, because esparto could no longer be imported, straw consumption started to boom; the peak was reached in 1945 when straw consumption was nearly 350,000 tons—still only 60 per cent of what Holland uses today. But now straw use had gone down to 78,000 tons and Britain was again importing more and more esparto. Esparto imports, in 1939 260,000 tons, had now reached 390,000 tons.

Neglected Cellulose

" Here is something remarkable," Dr. Straatman observed. " We have seen in plastics the very strong position which this country can have if it utilises British raw materials as much as possible. In straw we have got the raw material, the processes are available, and yet this country does not manufacture cellulose from this raw material!"

Dr. Straatman went on to explain how similar factors applied to rayon. "Viscose and cellulose are the bulk rayon exports—exports of rayon are about 140 per cent above pre-war, although cellulose has to be imported. If imports from dollar areas have to be cut and cellulose comes practically solely from dollar areas, that very big field of exports of rayon will feel the pinch, or else we will have to feel the pinch—in clothing. Even for rayon it is possible to manufacture the needed cellulose from home raw materials.

Meanwhile, the big Dutch rayon combine, A.K.U., had built a large factory to manufacture from straw a type of cellulose absolutely suitable to use as a raw material for viscose.

A Dollar Commodity

On the subject of sulphur, Dr. Straatman noted that of the three main sources, pyrites came from Spain and a few other countries—practically all requiring hard currency—sulphur was a dollar commodity and only spent oxide was a British raw material. Consumption of sulphur at the moment was 556,000 tons, and it was expected by 1952/53 it will have increased to 695,000 tons. That was to be compared with use by other countries—France 840,000 tons, West Germany 754,000 tons, Benelux countries 685,000—only 10,000 tons less than the United Kingdom, and Benelux has only 20 million population.

Some sulphur for sulphuric acid manufacture came from another source, mineral oil refining. By 1951, Holland would get from its mineral oil refining capacity 70,000 tons of sulphuric acid from the sulphur liberated during refining. At the rate mineral oil refining was being stimulated in this country, sulphur from that source might make a major contribution to the supply of home raw materials for the sulphuric acid industry.

One process which was finding more and more interest on the Continent (Holland, Belgium, France and Spain) related to anhydrite. " There are several BIOS and FIAT reports on the manufacture of sulphur and sulphuric acid using anhydrite as a raw material and, in the main, there are two different processes," said Dr. Straatman. " The first is by subjecting anhydrite to a reducing roasting with calcium sulphide as the resulting product. This can easily be decomposed with carbon dioxide to give hydrogen-sulphides, which again can easily be oxidised to sulphur. In the other series of processes the anhydrite mixed with clay is subjected to an oxidative roasting and gives, on the one hand, sulphur dioxide, which in turn gives sulphuric acid, and cement is obtained as a by-product."

Scope for Development

There was no doubt that for such simple chemical products as sulphuric acid and cement more use could be made of home raw materials, while greater production of sulphuric acid would give the country opportunity to manufacture more soluble phosphates. " As soluble phosphate we generally understand superphosphates, but several Continental manufacturers are devoting more and more attention to nitrophosphates," said Dr. Straatman.

Britain was far behind several Continental countries in the growth of its soluble phosphates industry. Production in this country just balanced consumption, and there was not an ounce for export, but even so, consumption per acre was only half what it was in Holland. There was here immense scope for superphosphate from home-produced sulphuric acid in agriculture.

Of nitrogenous fertilisers—a 100 per cent British raw material—Dr. Straatman recalled that, in the old days, chemists were wont to say you could not have fixed nitrogen unless you had cheap water power. Now for the manufacture of fixed nitrogen only coke oven batteries were needed.

" Britain produced just enough fixed nitrogen (1947 figure is 254,000 tons) to cover its own consumption. By 1952/53, production will be 287,500 tons and consumption, including colonial territories,

(continued overleaf)

will just be covered by that production. But if you look at consumption comparing Holland or Belgium with Britain, Holland uses three times the amount of nitrogenous fertiliser per acre—fertile as its soil is supposed to be.

"Air is a British raw material which you get for nothing and I cannot see why this country in the present circumstances should not use fixed nitrogen to improve yields in agriculture and to save dollars."

There were hardly any chemical products which could not be looked at from this angle, said Dr. Straatman. He suggested that a list should be compiled showing the hard currency content of the *ex-factory* price of chemical products—plastics, dyestuffs or sulphuric acids.

"I have compiled such lists for two Continental countries and they show amazing figures," he said. "You may say a certain product is a good one to stimulate for exports and when you look at the facts of the hard currency content you find it is not such a good product at all. It ought to be a crime to export cotton yarn, because the cost of the hard currency content is so extremely high.

"This is something which I should like more people to consider—the hard currency content of chemical production and ways and means to reduce that element, if it is possible, by other raw materials or other manufacturing processes.

"I know other raw materials and other manufacturing processes always mean a new building, new plant, and getting licences from a Government which is extremely careful in granting them. You have got to make a cast-iron case, to say that in a certain span of time you will produce the dollars. That is not a task for the Government, but a task for the manufacturer and the chemist.

"The chemist ought to figure out the hard currency content figure, calculate what he can do to lower it and so get his licence for building and extending his factory," Dr. Straatman concluded.

Continued Development of Natural Gas in France

NATURAL gas, occurring chiefly in the South-West of France, has during the last three years been an increasingly important factor in the French fuel economy. Interesting details on the exploitation of natural gas and the production of important derivatives are contained in the recently published report for 1948 of the Régie Autonome des Pétroles, a company which, since its formation by the French Government in 1938, has concentrated on the exploitation of the country's natural gas resources.

The quantity of natural gas exploited has risen from 9 million cu. m in 1942 to 250 million cu. m. in 1948, totals for the previous three years being 85, 110 and 174 million cu. m. respectively.

Derivatives obtained (in tons), and gross income derived (in million francs) for the years, 1945, '46, '47, and '48 are shown in the following table:—

Derivatives			
Propane/ Butane gas (tons)	Crude oil (tons)	Petrol (tons)	Gross Income (mill. francs)
696	740	3,700	213,2
733	120	5,289	400,5
1,441	626	7,331	748,5
2,396	1,620	2,824	777,7

A considerably increased quantity of natural gas is expected to be exploited this year. A number of up-to-date plants have been introduced in recent years at Saint-Marcet, Peyrouzet and Boussens. The most modern of these is probably that of the Usine de Dégazolinage de Boussens, equipped with U.S. machinery and apparatus, which has an annual capacity of about 1.2 million cu. m. of gas per day.

Distribution of the purified natural gas takes place through a network of pipelines having a total length of 527 km. It connects the plant at Peyrouzet with such important towns as Toulouse, Tarbes, Pau and Agen.

Openings for Executive Staff

A STATEMENT issued last week by the Ministry of Labour and National Service shows, for a large selection of managerial or executive posts, vacancies on the records of Appointments Offices on September 12.

Of the 48 professional categories listed it is significant that in only 13 of these, of which "chemicals manufacture and analysis" is one, are there more vacancies than registrants seeking employment.

The Ministry states that the main reasons for the co-existence of vacancies and available applicants in the same occupational group are that frequently applicants do not have the qualifications for which employers are looking. For the 82 openings for pharmacists the Ministry has but four registrants.

MORE DUTCH NITROGEN

Possible Export Surplus

OUTPUT of hydrogen by the Dutch State mines of Ijmuiden/Lutterade has lately been much increased while another nitric acid factory will soon be completed. Along with the Cie. Néerlandaise de l'Azote of Sluiskil and the State factory of Geleen they expect shortly to be able to increase the production of nitrogenous fertilisers on a scale to satisfy the rapidly mounting requirements (at present 125,000 tons p.a., as compared with 100,000 tons pre-war) and to dispose of a surplus for export.

The generators for the new conversion installation of Lutterade were provided by a British firm.

Although the Dutch superphosphate firms are reported to be working at full capacity it may not be possible to meet all home demands for the time being as superphosphate is an important item in trade with foreign countries.

Consultations between Belgium and Holland have been in progress to coordinate policies between the two countries for handling quinine salts of the Congo and Indonesia. No results have so far been made known.

Nylon in Holland

THE Algemene Kunstzijde Unie, the Haarlem rayon producer, has acquired the patent rights for the production of nylon from the E. I. Du Pont de Nemours. Owing to the elaborate character of the technique and especially the cost of installation, the A.K.U. will start with a pilot plant, and final output later is not expected to reach the current scale of production by I.C.I., Ltd., and Courtaulds. Some competition with the output from Pontypool in the European markets will, however, be offered. The A.K.U. is still experimenting, in conjunction with the Dutch section of the Royal Dutch/Shell (Bataafsche Petroleum Mij.), with a "fully synthetic" fibre of its own. It is believed to be a variation of polyvinyl chloride.

Colorimetric Determination of Bismuth

The review of this work (THE CHEMICAL AGE, *61*, 533) omitted the attribution—Yu. Yu. Lur'e and L. B. Guizburg (Zavodskaya Laboratoriya, 1949, *15*, *21*, *30*). The reference, A. I. Korkorin and N. G. Dermanova, was to the earlier work affecting the same subject.

MODERN INK PRODUCTION

Elaborate Plant and Instruments

SOME 40 members of the London Section of the Oil and Colour Chemists' Association recently visited the new printing ink factory of B. Winstone & Sons, Ltd., at Harefield. They were received by the works director, Dr. F. W. Stoyle, and conducted round the laboratories and works by him and by Dr. R. F. Bowles (chief chemist) and Mr. H. H. Stewart (works manager).

In the testing laboratories the visitors saw the methods used for comparing raw materials and finished products with standards, and in the research laboratories, where rheological problems especially are investigated, apparatus of particular interest included a cathode-ray oscillograph, several rotating viscometers, one of which was used for Dr. Bowles's empirical flow test, and a photo-electric reflectance meter.

Among the advanced equipment seen in the works were ball mills up to 500 gall. capacity and a battery of large roll mills, a works control room where inks are tested by scrapes, prints and fineness gauges; and a varnish house with kettles capable of heating 1½ tons of oil. Not the least impressive characteristic, common to all departments, was the scrupulous cleanliness.

Plastics Symposium

OBSERVING that chemists associated with plastics and polymer in Great Britain have for many years had no opportunity of meeting and discussing the recent advances of polymer science and their practical effects, the Plastics and Polymer Group of the Society of Chemical Industry has consequently decided to hold a three-day symposium in London in September 1950 under the title "Polymer Chemistry as Applied to Plastics."

It is intended as far as possible that the contributions shall be planned to bridge the gap between those engaged in theoretical studies and the industrial applications. Further information about the symposium will be published later. The honorary secretary for the symposium is Dr. N. J. L. Megson, Advisory Service on Plastics and Rubber, Ministry of Supply, R 716, Shell Mex House, London, W.C.2.

Aluminium Expansion

British Aluminium Co., Ltd., is extending its works premises at Swansea.

THE LARGEST CATALYTIC OIL CRACKER

Important Operating Economies in New U.S. Unit

MARKING the last step in the programme to effect a multi-million dollar expansion of its oil refinery facilities in two years, the Esso Standard Oil Company has formally dedicated its newly completed 41,000-barrels-per-day fluid catalytic cracking oil unit at Linden, New Jersey. It is said to be the largest in the world and to embody the most advanced principles in oil technology.

The objective of most of the modifications in the new plant has been to reduce to the minimum residual products and increase the yield of gasoline, heating oil, etc.

The new facilities include:

1. A vacuum pipestill (49,000 barrels per day), the largest in the world, which will make possible substantial increases in gasoline and heating oil yields. This unit receives residual oil and prepares from it a feed stock for the new catalytic cracking unit.

2. A fluid catalytic cracking unit and light ends recovery facilities (41,000 barrels a day). This single cracking unit will produce almost 1 million gal of gasoline, 250,000 gal. of heating oil, and 270,000 gal. of other distillates daily. The catalyst used is a synthetic powdered clay consisting of silica, magnesium, and aluminium.

3. Additional steam and power generating equipment, new salt water pumping and distribution facilities, and new process and utility pipelines which are necessary to integrate the new process units into refinery operations.

Next to its size, its comparative simplicity is the predominant feature of the cracker. The cracking section consists of only two main vessels, the reactor and the regenerator, mounted side by side at about the same elevation on the main structure. Thus the overall height of the structure has been drastically reduced—165 ft., compared to 239 ft. for older units This saved 800 tons of steel.

The catalyst capacity of the new cracking unit will be between 900 and 1000 tons. Catalyst will circulate at the rate of 56 tons a minute. One circulating line is almost 9 ft. in diameter and transports the catalyst at 1100°F.

Each gasoline gallon is calculated to require over three square miles of catalyst, surface worth $25; but since this fluidised catalyst is continuously reactivated the net catalyst cost per gallon of gasoline is less than 0.5 cent. The unit has more than 400 instruments located in one control room, so that it is possible for the entire unit to be run by only seven men.

The central unit of the oil cracker is the 35 ft. diameter reactor, wherein heavy gas oil is converted into lighter products in a turbulence of hot fluidised catalyst

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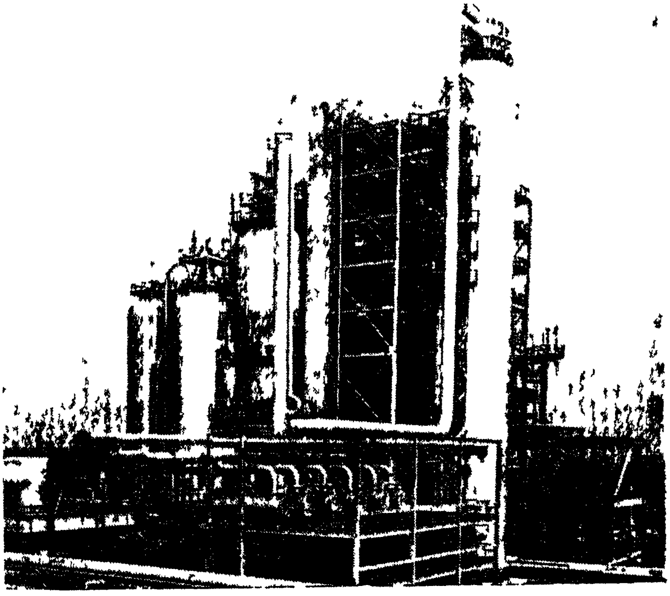


Vast catalyst store and regenerator (left) characterise the reactor unit

Petroleum Chemical Prospects: a U.S. Estimate

Were Early Forecasts Over Optimistic?

A USEFUL service was rendered the oil and chemical industries by Mr. J. Ostermeyer, president of the Shell Chemical Corporation, when he addressed the recent first Pan-American Engineering Congress in Rio de Janeiro. He sought to put into perspective, principally but not wholly from the U.S. standpoint, the rôle and prospects of chemicals made from petroleum.

The *Petroleum Press Service* presents his views with the comment that the great progress of the synthetic manufacture of chemicals from oil has caused this comparatively new branch to be represented as the oilman's short cut to success. Excessive optimism in this respect was dangerous, since the market for these products was much less reliable than that for ordinary oil products and was, moreover, susceptible to unforeseen competition.

One of the outstanding chemicals produced on a major scale from oil field natural gas is ammonia, and nearly all the huge ammonia manufacturing capacity, built during the war in the U.S.A., chiefly for the making of explosives, is now turning out fertilisers at a rate which is far above U.S. domestic needs. Thus, when the rest of the world has sufficiently recovered to make its own way, demand for these fertilisers is likely to decline, Mr. Ostermeyer foresaw. When this happens, the production of synthetic ammonia, from whatever source, is bound to suffer first, because it would have to face competition from ammonia produced as a by-product of the coking of coal.

Methyl alcohol is another important oil field product and most methyl alcohol plants can, like those for the manufacture of synthetic ammonia, be converted, at a moderate cost, to yield either product. These two products may thus be considered together and, according to Mr. Ostermeyer, it is a reasonable forecast that before long they will not call for more than 15,000 million cu. ft. of natural gas yearly, equivalent to about 0.3 per cent of total natural gas consumption in the U.S.A.

The main purpose of the Fischer-Tropsch plant now being built at Brownsville in South-West Texas by Carthage Hydrocol Inc., is to synthesise gasoline from natural gas; chemicals will also be produced, more or less incidentally. Consumption of the plant will be about one per cent of the annual total U.S. natural gas supply and about one-tenth of this will be attributable to the manufacture of chemicals.

There still appears to be some doubt, however, as to whether these can be separated and purified at competitive cost. The recovery of a pure chemical may easily be as expensive as its direct synthesis from other raw materials, including petroleum fractions other than natural gas.

Three important chemicals derived from the anticipated Fischer-Tropsch production at Brownsville, would together satisfy an appreciable percentage of total U.S. demand: ethyl alcohol roughly 3 per cent, n-butyl alcohol 3 per cent, and synthetic acetic acid 8 per cent.

The consumption in the U.S.A. of olefins for making chemicals (excluding gas components and synthetic rubber) is about 620,000 tons annually, produced both by cracking paraffins and by refinery cracking or reforming units. For every barrel of refinery light olefins for chemicals, 30 barrels are used for making refinery products.

LARGEST CATALYTIC OIL CRACKER

(*continued from previous page*)

Preheated gas oil feed, in a liquid state, is contacted with hot regenerated catalyst in the reactor inlet line. Immediately the oil is vaporised and the expanding vapours flow up into the reactor, carrying the catalyst with them. Within the reactor the oil vapours flow through a dense bed of catalyst where complete mixing and intimate contacting quickly completes the cracking reaction.

Before leaving the reactor, the cracked vapours pass through cyclone collectors, where the entrained particles of catalyst are separated and recovered. In a primary fractionator (130 ft. by 20 ft. diameter) product streams of gas, naphtha distillate, heating oil, light gas oil, and heavy gas oil are removed. The fractionator tower is actually taller than the cracking unit—a radical departure from early designs.

The regenerator is 55 ft. in diameter and is composed of a 20-ft. cylindrical section with a hemispherical head and cone bottom. Its design in these vast proportions was made possible by the inherent simplicity of the catalyst equipment.

A NEW INDUSTRIAL SOLVENT

Valuable Selective Action of Acetonitrile

From A SPECIAL CORRESPONDENT

ACETONITRILE, also commonly known as methyl cyanide or ethyle nitrile, is now assuming interest as a selective solvent or extraction medium for cellulose esters, celluloid, collodion, lacquers, alkaloids and fatty acids. A clear, colourless liquid with a characteristic ethereal odour, acetonitrile distills without decomposition. It forms constant boiling mixtures with most solvents: with water, its constant boiling mixture contains approximately 84 per cent acetonitrile and 16 per cent water, boiling at 76°C.

The new solvent is miscible with water, methyl and ethyl alcohol, carbon tetrachloride, acetamide, methyl and ethyl acetate, ethylene dichloride, ethyl ether, acetone, most unsaturated hydrocarbons, and many other compounds, but is immiscible with many saturated hydrocarbons, such as the paraffin series. It has a boiling point of 81.6°C.; freezing point —44°C., flash point 66°F., and vapour pressure (mm. mercury 20°C.) 50.2. Acetonitrile is stable and may be stored in steel containers. Due to its high vapour pressure, it will evaporate rapidly.

Toxicity

The quantitative toxicity of acetonitrile is close to that of acetic acid and, although it is not irritating to the skin, it is capable of penetrating it. Its effects, however, are not cumulative and it is reported that in the animal body the compound hydrolyses to form acetic acid and does not liberate hydrocyanic acid. The action of the vapours of this solvent differs from that of the chlorinated hydrocarbons and no damage to the internal organs seem to result, such as may be produced by carbon tetrachloride. Symptoms of acetonitrile poisoning resemble those of asphyxia and they disappear within a comparatively short time after removed from exposure.

A good deal of investigation has been carried out, particularly by the Niacet Chemicals Division of the United States Vanadium Corporation, on the general usefulness of acetonitrile as a selective solvent in industrial processes. It has been shown that this compound can be used for the following purposes:—

1. As a diluent or water extracting supplementary agent for the sulphonation of fatty acids, oils, resins and some other raw materials.
2. For the removal of resins, tars, phenolic substances, colouring matter, etc., in the refining of paraffin hydrocarbon oils.
3. For preparing neutral waxes by extraction of waxes with a high acid number.
4. For separating edible fish liver oils from fish livers.
5. For the separation of cellulose esters from cellulose ethers.
6. For the extraction of stearic acid from mixed fatty oils and fats, since most technical fats and oils, with the exception of castor oil, are not soluble, or only slightly soluble, in hot acetonitrile.
7. For the deacidification of many fatty oils. Fatty acids of linseed and cottonseed oil are easily soluble in hot acetonitrile, while the liquid fatty acid glycerides are not, or only very slightly soluble.

Selective Extraction

By exploiting the special characteristics —that acetonitrile will not dissolve most fatty acid glycerides and will dissolve fatty acids; will dissolve all cellulose esters but not cellulose ethers; dissolve Celluloid, colloidion and lacquers but no saturated hydrocarbons, fats, fatty oils and resins—the chemist is able to make use of this solvent for selective extraction where many other well known media have failed.

In analytical work, acetonitrile can be successfully employed in the separation of amber rosin and many fused copal types from venetian turpentine, Burgundy pitch, coumarone resins and rosin. It can also be utilised in the separation of cellulose esters from caoutchouc, guttapercha or Balata.

$9 M. for Grangemouth Plant

APPROVAL has been given by ECA to a project to purchase machinery for the use of the petroleum chemicals plant to be established at Grangemouth, Scotland, at a cost of $9 million. This is the plant to be owned and operated by British Petroleum Chemicals, Ltd. (the Anglo-Iranian Oil Company and the Distillers Co., Ltd.). Dollars to cover the cost of machinery will be provided by ECA, British Petroleum Chemicals paying the full market price in sterling.

DEVELOPING TERPENE CHEMISTRY

Sir John Simonsen's Address to ACS

ONE of the major events at the 116th meeting of the American Chemical Society held at Atlantic City last month was the address to the Division of Organic Chemistry, by Sir John Simonsen, director of the Colonial Products Research Council of the Colonial Office, who was the first recipient of the Fritzche Award for research on essential oils.

Sir John's address is reported at some length in the *Chemical and Engineering News* (27. 2921) from which the following is extracted. He recalled his early association with W. H. Perkin and noted the development of terpene chemistry as he proceeded.

He became interested in essential oils, he said, as a chemical adviser to the Indian Munitions Board during World War I, observing difficulties with the easy oxidisability of Indian turpentine. In 1920 he began investigating the problem and was eventually led to the discovery that the main constituent was Δ^3-carene.

In this work he developed the idea that the carene and its 4 isomer would be found distributed widely in nature and that sylvestrene did not occur in pine oil from *Pinus sylvestrus* as postulated. This he later showed to be the case, thus removing the one standing exception to the isoprene rule.

Dr. Simonsen went on to describe a number of his adventures in terpene chemistry, which have done much to lay the foundation and develop the body of modern terpene chemistry. Some of the terpenes included thujene, curcumenes, di- and tri-ketone terpenes, dehydrogeranic acid, the first sesquiterpene ketones: the eremophilones, santalols, caryephyllenes, and laneol.

Dr. Simonsen commented with enthusiasm on developments in technique since he began his work and the consequent enhancement of possibilities for accurate and thorough work. However, he urged that the value of good chemical evidence should not be cast aside, as it is often important in substantiating conclusions drawn on the basis of physical measurements, such as ultraviolet absorption and infra-red and Raman spectra.

Dr. Simonsen also offered comments on the future of terpene chemistry. In answering his own question on the value of isolating constituents of essential oils and determining their structures, he said that in addition to the intellectual satisfaction of the research worker, there is a more fundamental aspect.

Such knowledge can prove of much value to the taxonomist, he contended, and he suggested that, until we know all the constituents in a growing plant, it will not be possible to have a sure scientific basis for agriculture, horticulture, and forestry.

Two great problems remain in terpenes: the mechanism of their formation and the part they play in plant metabolism. Dr. Simonsen expressed increasing optimism for the finding of answers to these questions.

African Scientific Research

THE African Regional Scientific Conference, which opened at Witwatersrand University, Johannesburg, last week, brought together almost every country having territorial interests in the African continent, to study African problems and the closer integration of scientific research among nations. Water conservation, exploitation of mineral wealth, and the improvement of health are among the principal subjects.

Observers from the United Nations Food and Agricultural Organisation. Unesco, WHO, the U.S. National Research Council and the Australian Council for Scientific and Industrial Research are participating. Spain has not been invited.

Canadian Fellowships

CHEMISTRY will receive 18 out of approximately 31 post-doctorate fellowships for 1950-51 which are being offered by the National Research Council of Canada. Three will be granted for atomic energy research, and about 10 in physics.

The stipend is $2820 a year, tax free, and is supplemented by travel grants for successful candidates from abroad.

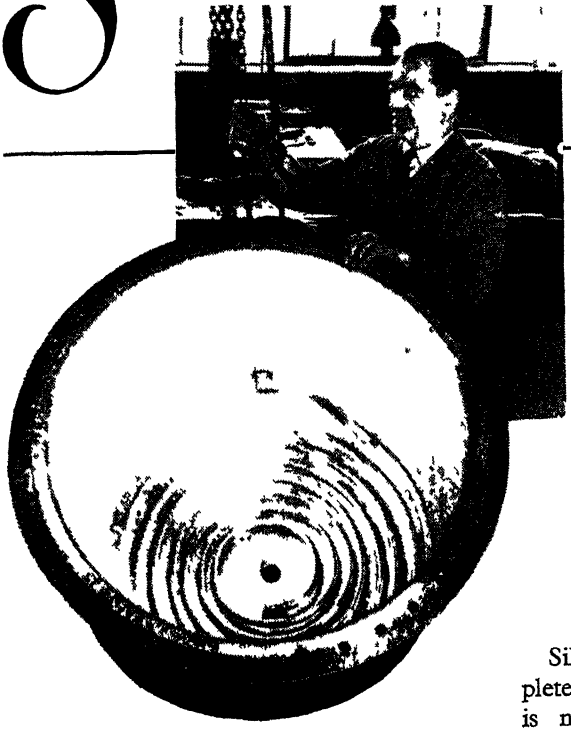
Appointments at the Atomic Energy Project, Chalk River, are restricted to Canadian citizens and British subjects, but applicants of all nationalities are invited for the divisions of chemistry and physics.

Applications should be made to the secretary, Laboratories Awards Committee, National Research Council, Ottawa.

Metallurgical Section

Published the first Saturday in the month

Silver is best for acetic acid



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Metallurgical Section

5 November 1949

NEW TRENDS IN POWDER METALLURGY

Swiss and Czechoslovak Modifications

SEVERAL specifications relating to powder metallurgy have recently been announced in the Official Patents Journal, as open to public inspection. Three are from Switzerland (Primavesi) and three from Czechoslovakia (Skoda Works).

The first, amplifying Primavesi's numerous patents of a year or two ago, now claim improved methods both for electrolytic iron powder and for a chemical process from low-grade iron ores. The Skoda firm has introduced improved methods for preparing almost non-porous compacts, mainly through modified heat treatment.

In the English patent No. 32066/1948 (Conv. date 16.12.47), D. Primavesi, of Lugano, describes electrodeposition of readily pulverisable iron for purposes of powder metallurgy. Reference is made to a similar German specification No. 637,529 of Degussa (Deutsche Gold- u. Silverscheide Anstalt vorm, etc.) and to U.S. patents 2,099,873 and 2157. The German method referred to uses ferrous chloride electrolyte and an ammonium salt such as the chloride, and organic acids, at 90-100°C., a high current density, and *p*H of 6.5-7.2.

No Organic Acids

Using a similar electrolyte, with 50-100 g. iron per litre, together with ammonium chloride, it has been found, according to the present invention, that organic acids and compounds can be omitted. These latter introduce a certain amount of carbon into the electrolytic iron, thus reducing its magnetic values.

Current density used is 500-2000 amp./sq. m. Renewal of electrolyte is kept at a rate which excludes excessive heating and the temperature is maintained at about 40°C. normally, with *p*H of 3-6, so that iron waste material is dissolved. Insoluble graphite anodes are used, with iron or aluminium cathodes, which may be movable strip since the thickness of the iron deposit is very small. The diaphragm may be of glass wool or the like. Formation of chlorine gas at the anodes is said to be prevented by placing in the anode chamber, up to about 20 per cent of its capacity, waste iron or filings; there is some decrease in the bath voltage through removal of anodic chlorine—probably due to depolarisation.

When the iron deposit is about 1 mm. thick it is removed, ground (wet or dry—it is very friable) to any desired fineness to produce a material similar to carbonyl iron powder of particle size 1-5 mu. The product is tried with careful exclusion of oxygen, and then reduced for about two hours in hydrogen at 600-800°C.

Chemical Conversion

In the English patent 32363/1948 (Conv. date 16.12.47), Primavesi claims a method for production of metal powders—in this instance—iron powder, by chemical means—the conversion of oxides to chlorides by treatment with HCl, which is recovered and re-used.

Any raw material containing iron oxide, even of low grade, is ground and exposed to a stream of HCl gas at a temperature of not more than 950°C., resulting in the formation of ferrous or ferric chloride. Other metal chlorides formed are removed and, if desired, their respective metals can be recovered by re-distillation in HCl gas at temperatures below 850°C.

The purified iron chlorides are reduced in hydrogen at a temperature below the melting point of ferrous chloride (670°). Sponge iron formed thus is ground to any desired fineness in a mill, washed with distilled water, and dried. Prior to moulding it may be again reduced in hydrogen and re-ground. The residual gas after reduction—mainly hydrogen, with some HCl—is recovered and used.

Primavesi also claims—in English patent No. 32717/1948, conv. date 19.12.47—an improved method for producing hard sintered alloys of tensile strength exceeding 30 kg./mm^2 or 43,000 p.s.i.

Fabricated sintered metal powder parts

are being increasingly used for many important manufacturing purposes. It has been found, however, in the use of iron and steel, that a relatively low elongation is often a serious drawback: with a sintered iron product elongation is often less than half that of ordinary iron; and with steel-sintered parts it may be only about one-fourth.

It has been a practice to reduce the carbon content of steels and replace it with another element, such as copper. This element, in sintered steels, behaves differently from carbon. While in sintered steels an increase in carbon content leads to increased strength and to decrease in quality grade coefficient; iron-copper alloys differ in that, with little copper, they have a grade coefficient twice that of sintered steels of equal strength, the benefit increasing with copper content. Based on this is the claim now made for a sintered alloy capable of being hardened and tempered, consisting mainly of iron, and in which the carbon is replaced by copper, up to not more than 6 per cent.

Non-Porous Compacts

Further evidence of the post-war activity of the Skoda Works in powder metallurgy is represented by a claim to have a method of producing almost non-porous sintered hard metals. This is contained in their English patent No. 31804/1948 (conv. date 15.12.47).

Shaped components made of sintered hard metals with organic binders are usually pressed to shape, but there is little or no shrinkage in the first sintering; and only shaped parts machined from the pressings undergo, during second sintering, substantial shrinkage, of 20-25 per cent linear or 50-60 per cent by volume. Various attempts have been made to eliminate pores and produce more compact material, but these are mostly difficult, time-consuming, and ineffective. A better way, according to the present invention, is a substantial change in the first sintering operation.

The rods pressed out of hard metal are not sintered at 700-1000°C. until the first appearance of solidification; they are sintered at a higher temperature, but not so high as to cause substantial shrinkage. The required temperature can be determined from the equilibrium diagram of tungsten carbide and cobalt alloy, *e.g.*, that of S. Takeda, according to cobalt content. The melting point of cobalt is normally about 1250°C., but varies somewhat with tungsten carbide content and fineness. However, a temperature of 1150°C. should not be greatly exceeded.

The present method therefore consists chiefly in pre-sintering the pressed hard metal rods for half an hour at a temperature of about 1250°C. or, according to composition, at the temperature at which the bonding or additional metal just begins to melt (softening point). It is possible then either to produce in the usual way from such pre-sintered rods thin hard metal plates, or crush the rods mechanically, repeating this once or twice. Several favourable results are thus claimed.

If the pre sintered hard metal is ground, the carbide grains are better enveloped by the soft metal, conferring improved non-porosity of finished product, and the hardness of the added metal (bond) is increased. If toughness, rather than hardness, is required, the heat treatment may be varied accordingly, *e.g.*, by slowly cooling to 1000-1250°C.

There is a certain similarity in the English patent No. 32319/1948 (Conv. date 16.12.47). for improved hard metal alloys. This, however, relates to mixed carbides, wherein (as before) the added bonding metal of relatively low melting point dissolves the carbide particles.

In the present instance it is stated that, for the individual carbides, the bonding metals are those which will at least partially dissolve the respective carbides, on sintering, and, on cooling, again eliminate them as far as possible.

Cobalt is used as additional metal for the carbides of tungsten, titanium, and zirconium; and nickel for those of molybdenum, tantalum, and niobium. The nickel exceeds the cobalt by 15-20 per cent. The carbides, together with associated addition metals, are subjected to intermediate grinding before final treatment.

The English patent No. 32713/1948 (Conv. date 17.12.47) of the Skoda Works relates to moulded bodies made of sintered hard metal. Sintered hard metals are distinguished by their high degree of hardness, almost approaching that of the diamond, but have relatively low strength and toughness. The ideal state for tools and other articles subjected to hard wear

(*continued at foot of following page*)

WIDENING WELDING TECHNIQUE

Rewarding Applications to Rolling Stock

THE many examples of modern applications of welding which had taken place to date, were the best augury for the growth of the method in the future, said Mr. O. V. S. Bulleid, president, at the opening meeting of the autumn session of the Institute of Welding, held in London on October 25.

The progress, he affirmed, had been helped by the efforts of the members of the institute, who, by keeping before engineers examples of welded construction, and by lectures, papers and books, had disseminated a knowledge of work done and of the possibilities. Thus had they broken down the inertia and fear of change of practice, which acted so perniciously against the progress of British engineering in many fields.

Welding offered an invaluable tool, especially to-day, when saving of weight was at last appreciated, and it was a craft which demanded a high standard of integrity. It behoved us to develop the training of men to provide the craftsmen needed for the further development of welding. We should not pretend that welding could be done by other than craftsmen, but should support the craftsmen using welding and they would give the loyal service needed.

In research they had every help from the British Welding Research Association and it was their duty to support it and to see that its research was devoted above all to the development of welding by simplifying and cheapening it. For example, continuous machine welding could be developed and, if costs were to be reduced, must be developed. The preparation of the work for welding was another source of cost requiring close attention if they were to reach the ideal of " cheaper than riveting."

The railways were a prominent field in which welding had been successfully applied. The gradual application of welding to rolling stock prepared the way to the latest innovation in rolling stock on the Southern Region of British Railways. The double-decker coaches would not have been a practical proposition were it not possible to fabricate the body frames, etc. Those trains, with no increase in weight, carried more passengers seated than the previous trains.

The " Leader " class of locomotive also was an excellent example of what could be done by fabrication by welding. The boiler was welded, as also were the main frames. The bogie, with its cylinders, frames, and stretchers, was welded into a monobloc structure.

The latest design of 16-ton railway wagon was 1 ton 7 cwt. lighter by the application of welding and flame cutting techniques to the frame, body, and details. An extremely valuable use of welding in the production of rolling stock details was obtained by welding together pieces which might be flame cut, drop stamped, or forged.

NON-POROUS COMPONENTS

(*continued from previous page*)

is an outer working edge or rim which is very hard, with an inner core which is very tough and not necessarily so hard. Various methods of producing hard surfaces are known, but suffer certain disadvantages.

In the present invention it is claimed that such defects are overcome by selecting the kind and proportions of added or bonding metal; it is implicit that any increase in strength and toughness is gained at some sacrifice of hardness. Thus, it has been found advantageous to produce a hard metal with a core containing more cobalt as bonding agent than the rim or outer zone in which the hard constituent is tungsten (wolfram) carbide or tungsten-titanium carbides.

With other carbides nickel may be used (see previous specification No. 32319/48). Thus the core may have 11-13 per cent cobalt and the rim only 5 per cent, so that the core may have strength and toughness double that of the rim.

The manufacture of plates or other moulded bodies of this type may be achieved in various ways. Thus, the powders of hard metals with different cobalt contents may be placed in layers in the press mould.

The hard metal (carbide) and added metal is then subjected to pressing and sintering. The finished body consists of zones distinguished by different cobalt contents. During sintering these zones tend to diffuse somewhat into each other, which is a further advantage. This method may be used also for large moulded hard metal bodies.

COLD WELDING ALUMINIUM

U.S. Adopts a U.K. Process

THE great practical value of a British innovation, recently patented, permitting satisfactory cold welding of aluminium, has found recognition in the U.S.A., where a company has been formed, the Koldweld Corporation, which has links with the Cornell-Dubilier Electric Corporation, to exploit the process. This was announced by Mr. W. Dubilier, founder and technical director of the latter company, on his return to the U.S.A. after consultations with the British originators and patentees of the present procedure, the General Electric Co., Ltd., of Kingsway, London.

Division of Royalties

The American company is about to stage a comprehensive demonstration of the new process, which is applicable to aluminium and comparable metals, the basic importance of which is that it accomplishes welding without electricity or applied heat. American rights were acquired by the Koldweld Corporation under an agreement providing for a division of the proceeds between the American and British firms.

The process, which has proved most readily applicable to aluminium and copper, said Mr. Dubilier, might revolutionise industrial and job welding in these fields. The tools required are inexpensive, and provide for the first time a means of fusing light or small parts by means of hand-operated devices, requiring no special skill. Fundamentally, the method consists of the application of moderate pressure with specially designed hand tools under controlled conditions.

Mr. Dubilier, an inventor with several hundred patents, mainly in the electrical field, to his credit, said he had considered himself " retired " when the British welding developments came to his attention.

To secure the widest possible use of the new process, he said, manufacturers would be licensed, paying fixed fees based on the value of products or parts produced. The Koldweld Corporation itself will do no manufacturing, confining its activities to licensing others to use the tool designs.

It is reported that both the Lockheed Aircraft Corporation, and the Piper Aircraft Company are among the first American aircraft companies to have undertaken tests of the new welding method as a means of eliminating much present welding and rivet work.

ADAPTABILITY OF STEEL

W. of Scotland Expert's Review

THE iron and steel trade was fully alive to the need for the application of science to industry, claimed Mr. W. Barr, in his presidential address to the West of Scotland Iron and Steel Institute in Glasgow on October 21. This was shown by post-war records of production and by the activities of the British Iron and Steel Research Association.

Development of new and better products was a feature of metallurgical research, which had a particular appeal at the moment because of the opportunity it provided for exploiting existing knowledge, of which there was a vast accumulation waiting to be turned to practical account. Mr. Barr outlined some of the work undertaken and the results obtained along these lines in the West of Scotland in recent years.

In spite of the remarkable increase in the production of alloy steels in the past few decades, ordinary mild steel still constituted the great bulk of production, he said. Troubles of a minor nature arising from cracking either in fabrication or service had occasionally been encountered but, generally, mild steel was regarded as having ample ductility for all practical purposes, and it was only with the advent of welding on a large scale that confidence in that respect had been shaken in some quarters.

Mild and Clad Steels

British failures in mild steel structures in this country had been relatively few. There had certainly been nothing of the catastrophic nature which had been experienced elsewhere—a tribute to British steel, design, and workmanship. Nevertheless, the occasion was not one for complacency, since the application of welding in British shipbuilding was being rapidly extended to larger vessels, incorporating plates of increasing thickness.

The spectacular progress accomplished in recent years in the chemical and oil industries owed a great deal to the availability at an economic price of structural materials possessing, in addition to adequate strength and ductility, the capacity for resisting the attack of highly corrosive substances. The relatively high cost of stainless steels had given rise to wide interest in chemically resistant clad steels, the main body of which consisted of the less expensive and more easily fabricated mild steel.

Fast Electrolytic Metal Polishing

Simplifying A Technical Process

A NEW instrument which holds promise of changing electrolytic metal polishing from a highly technical process to a method readily adaptable to workshop control was demonstrated in London last week.

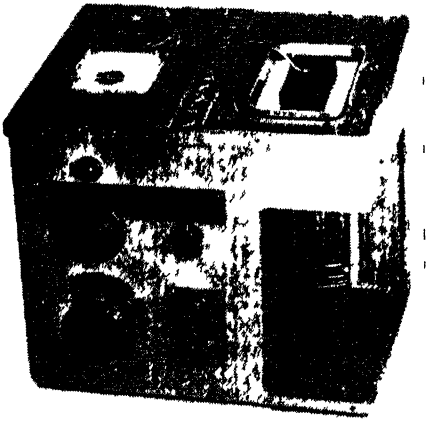
The apparatus, known as the Disa-Electropol, is intended more particularly for the electrolytic polishing of metallurgical specimens which are to be subjected to microscopic examination.

Main features of the Disa-Electropol are its extreme simplicity, which enables untrained people to learn to use it in a very short time, and the speed with which the entire operation can be completed.

When dealing with samples of steel and iron the polishing process itself generally takes about 20 seconds and the entire cycle from the moment a specimen has been prepared by grinding a flat surface on it till the polish is complete, including after-etching, washing in alcohol. and drying, takes about 3 minutes.

On most steel samples the etching may be made electrolytically in continuance of the polishing, simply by turning a switch a few seconds before the polishing time is up.

In other cases a simple but ingenious device permits an electrolytic after-etching with other electrolytes without exchanging the liquid in the apparatus.



[Courtesy, Laboratory Equipment (London), Ltd

The Disa-Electropol for rapid production of polished metal surfaces for microscopic examination

The specimen to be polished is kept in position by a clamp over a small plate which can be changed to vary the size of the surface requiring treatment. The electrolyte is held in a container and the liquid is pumped up so that it flows over the object, thus ensuring an even distribution and helping to keep it cool.

Thorough Trials

The Disa-Electropol, construction of which was suggested by E. Knuth-Winterfeldt, has been given thorough laboratory and practical working tests before being put on the market. It has been officially accepted as the standard means of electrolytic metal polishing at the Danish University, Copenhagen. It is being distributed in this country by Laboratory Equipment (London), Ltd.

An obvious impediment to wider industrial application of the instrument is the comparatively small areas (a maximum of about 100 sq. mm.) which can be polished. The instrument, at this stage of its development, is somewhat costly. That, however, may be changed when the apparatus becomes more generally used.

The Disa-Electropol has been publicly demonstrated in London and Sheffield.

Tackling the U.S.A. Markets

THE initiative of a private firm intended to assist the small exporter to tackle the American market was reflected at a reception in London this week, when Mr. A. N. C. Varley, director of C.P.V., Ltd., gave a talk on market prospects he had noted during a visit to the U.S.A. He suggested that, while many British firms could not hope to break in on the mass market, there were plenty of opportunities for a sectionalised trade opening. New York was not the United States and there was almost endless scope in Texas and the markets of the Middle West. A preliminary market research report, however, was essential.

America was a great country for factual information and the " higher-ups " of most big firms were more easily approachable than in this country, said Mr. Varley. Too little use was being made of the British Embassy, consulates and commercial attachés.

Greater Output of Non-Ferrous Metals

September Stocks Show Slight Reduction

CONSUMPTION of non-ferrous metals in the United Kingdom in September was marked by a general increase and, although production in most grades was higher, closing stocks at the end of the month showed a slight reduction all round.

Details of production, consumption, and stocks (set out below) are abstracted from the summary supplied by the British Bureau of Non-Ferrous Metal Statistics.

UNWROUGHT COPPER

	Long Tons Blister Copper	Long Tons Refined Copper
OPENING STOCKS:		
Govt. and consumers'	57,619	92,329
Imports	10,036	16,730
PRODUCTION:		
Primary	—	11,691
Secondary	2,165*	7,123
CONSUMPTION:		
Primary	11,827	29,509
Secondary	—	14,575
Exports	3,189†	26
CLOSING STOCKS:		
Govt. and consumers'	53,663	91,573

*Rough copper

† Includes 933 tons rough copper dispatched to Belgium and 2,256 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products ...	...27,281	long tons
Alloyed copper products ...	...23,950	,, ,,
Copper sulphate	... 3,320	,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Long Tons Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	30,021	75,743
Imports	13,850	9,909
PRODUCTION:		
Virgin and remelted...	—	6,156
CONSUMPTION:		
Virgin (incl. debased)	7,632	18,447
Remelted and scrap ...	—	7,734*
Exports and Re-exports	—	26
CLOSING STOCKS:		
Govt. and consumers'	36,239	73,862

*Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons Lead in Concentrates	Long Tons Imported Virgin Lead	Long Tons English Refined	Lead Content of secondary Srcap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	63,210	2,007	—
Other stocks...	31	—	—	—
IMPORTS ...	—	14,172	—	309
PRODUCTION ...	205	—	2,435	—
CONSUMPTION ...	227	17,389	2,539	10,890
Exports ...	—	38	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	61,491	1,903	—
Other stocks...	9	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,872
IMPORTS	24
PRODUCTION	2,122
CONSUMPTION	1,811
EXPORTS AND RE-EXPORTS	553

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	397
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	395

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	45.95

Key Industry Duty Exemptions

THE Board of Trade has under consideration the renewal from January 1, 1950, to June 30, 1950, of the Exemptions from Key Industry Duty as set out in the various Safeguarding of Industries (Exemptions) Orders. In particular, the Board is considering the discontinuance of the exemption of the following chemicals:—

Acid dipropyl-malonic, acid filicic, allyl paracetaminophenol, amido-guanidine sulphate, butyl methyl adipate, cumenol (pseudo), methyl cyclchexanol methyl adipate, p-di-ethoxy ethenyl diphenyl amidine and its hydrochloride, elbon (cinnamoyl para-oxphenyl-urea), eukodal, kryofin, N- (oxy-aceto-mercuric-propyl)-ethylurethane, oxymethyl para-oxyphenyl benzlamine, methyl sulphate, a-napthyl isothiocyanate, nickel hydroxide, 4-oxy-3-ethylamino-phenyl arsenic acid N-methyl tetrahydropyridine B-carboxylic acid methyl ester, phenetidylphenacetin and its hydrochloride.

Any representations on the subject by individuals should be addressed to the Industries and Manufactures (General) Division, Board of Trade, Millbank, London, S.W.1, before December 3.

Indian Geological Survey

Search for oil and for a number of important minerals is to be continued by the Geological Survey for India, 1949-50. Copper deposits are to be investigated in the Darjeeling district of Sikkim, and a geophysical survey will be made of deposits in Khetri (Rajasthan) and Nellore district (Madras). There is to be detailed prospecting for lead in Tehri Garhwai and investigation of iron ore deposits in several provinces.

ELECTRO-CHEMICAL DEPOSITION

Well Co-ordinated Scottish Departments

THE Fescol process is a method of electro-chemical deposition which is suitable for restoring to size, or building up worn or undersized parts and providing them with a corrosion-free surface which is highly resistant to wear.

As its application is a cold process, the structure of the basis metal remains unchanged, and no distortion occurs. Deposited materials in common use are nickel, chromium, copper, and lead.

Intimate adhesion or interlocking to the basis metal is the keynote of the method. The deposit and base being united by zones of atomic attraction, any required thickness can be applied.

While the majority of work to be undertaken consists of depositing on external surfaces, internal work can be undertaken within certain limits.

The method has been developed by Fescol, Ltd., whose latest development is the opening of a new works at Port Glasgow, covering an area of about 16,000 sq. ft.

The general arrangement there provides a nickel composition department situated on one side and the chromium department on the other. Ancillary departments such as materials, stores, inspection, polishing, etc., are situated in the centre, where they can serve either of the production sides with equal facility. There are separate goods entrances with adequate handling arrangements for incoming and outgoing components.

Easy Operation

The nickel depositing department comprises a battery of ferro-concrete vats, with acid-resisting linings, excavated to such a depth as to allow for maximum head room, while providing a convenient height for the operators. There is no staging, all work being carried out from floor level. The floor is laid with special acid-resisting material, and surface drains take care of the effluent.

A smaller battery of nickel vats is situated alongside the main line, to deal with lighter articles which do not require the service of an electric hoist. In this case the current is supplied from Westalite rectifiers situated close to the vats themselves, the group forming a complete entity with its own compressors, filters, air agitation, etc.

The range of heavy nickel depositing vats in operation at Port Glasgow

The chromium department, like its nickel counterpart, is in one line.

The deep vats are nearest to the entrance, and are contained in a concrete trench, lined with acid-resisting material, and suitably drained. Easy access to the trench is provided, and the tanks can be readily removed for repair and maintenance. Next to these are the smaller vats which sit in separate compartments, the outfall from which leads into a common drain.

Low tension current comes from Westalite rectifiers and each vat is self-contained so far as current supply is concerned. As these rectifiers can be located in close proximity to the vats, advantage has been taken of this to place the rectifiers between the wall and the drainage ditch, so utilising what would otherwise be waste space, while allowing for easy removal and maintenance of the rectifiers.

Voltage drop is avoided by the use of short bus-bars, an important consideration when dealing with low voltage current. Each vat has a self-contained fume-exhaust system, and thus, in the event of an interruption due to breakdown, only the unit concerned is affected. The fumes are taken through the wall in trunking and are discharged to atmosphere at high level, where they are dissipated.

CORROSION EFFECTS ON STEEL

Newer Methods of Estimation and Prevention

CORROSION resistance and corrosion fatigue of steel were the subjects of a number of authoritative papers, followed by very useful discussions, at a recent joint meeting in London of the Iron and Steel Institute and the British Iron and Steel Research Association. Mr. T. M. Herbert, chairman of the Corrosion Committee of the BISRA, presided.

During the morning session four papers concerned with atmospheric corrosion were discussed, all being presented by their authors. The first was "A simple form of accelerated atmospheric corrosion test," presented by Mr. R. St. J. Preston, of the Chemical Research Laboratory, Teddington.

Accelerators

Mr. Preston emphasised that this was not an accelerated weathering test, but one where the main agents of corrosion were produced in controlled conditions. He described how specimens are subjected to corrosion in a warm humid atmosphere containing sulphur dioxide.

The effects of temperature and concentration of sulphur dioxide on rates of corrosion of bare and phosphated steel, with and without paint coverings, had been examined, and it had been found that corrosion rates increased with rise in temperature and with increase in sulphur-dioxide concentration.

Pre-treatment by phosphating improved the corrosion resistance of painted steel, particularly when the paint coating was less than 0.5 mm. thick. A thick phosphate coating, which completely covered irregularities in the steel surface and therefore did not conduct electricity, showed a resistance in outdoor exposure tests much superior to that of bare steel.

Results obtained with this apparatus were far more representative of the behaviour of protective material in industrial atmosphere than were those given by the salt spray test.

In the discussion, Mr. S. C. Britton (Tin Research Institute) stated that, for those applying protective processes for use in industrial atmospheres, the test described would certainly be useful for checkin the quality of material supplied or for the maintenance of standards on the production line. Quick results were essential and the test promised to give a reliable order of merit for similar processes.

Those who wished to choose a new method of protection and those developing new methods might not be so well suited since they wanted estimates of the useful lives of rather different materials. He was not convinced that the method as it stood could give even a reliable order of merit for dissimilar materials. He recalled tests made with Dr. U. R. Evans in which exposure of different metals over SO_2 solution failed to give orders of merit consistent with those obtained on atmospheric exposure.

Mr. Britton suggested that reliability in predicting the service behaviour of dissimilar materials could be improved, at some sacrifice of acceleration, by using lower concentrations of SO_2 and by introducing into the test periods of drying out of the samples and of washing down with water, both important features of normal corrosion.

Mr. T. Henry Turner (chief chemist and metallurgist, Railway Executive, E. & N.E. Regions) asked whether the test was limited to the standard 6 by 2 in. shape; users require to test irregular shapes such as nuts and bolts. If Mr. Preston's test could be developed for adoption as a British Standard test, that would be of real value to industry, but it seemed undesirable to have to miss out the features of the samples and of washing down with were experienced in industry.

Atmospheric Shield

Dr. Mayne, a member of Dr. Evans' team in Cambridge, raised the point that this test involved an important principle Was one attempting to accelerate corrosion or to accelerate the breakdown of paint? Hudson and Banfield had shown how corrosion of a painted steel in a heavily industrial area such as Sheffield was not more rapid than elsewhere. It had been thought that the slow results from exposures in Sheffield had been possibly due to the fact that ultra-violet light was kept off the specimens by the atmospheric pollution and by accumulations of deposit. The effect of ultra-violet light had been confirmed by American work. He pointed out that this factor had been entirely neglected in this test.

Dr. Vernon, of the Chemical Research Laboratory, DSIR, said that accelerated tests at Teddington based on the use of SO_2, had accurately reproduced the well-known curve showing the effect of copper content on corrosion rate, salt-spray tests had failed to reproduce this relationship.

Mr. Preston, replying, stressed the importance of controlling the SO_2 concentration. It had been shown by some investigators that at two different SO_2 concentrations the orders of resistance to breakdown of some materials could be reversed.

The influence of ultra-violet light on the longer life of specimens exposed in a heavily polluted atmosphere, compared with a non-industrial atmosphere, was thought by Mr. Preston to be a matter of shielding of the paint film by the deposit of atmospheric debris. It was not unusual, he thought, to use black finishing paint, containing opaque pigments for tropical conditions, probably with the same objective.

Tests of Alloy Steels

The corrosion resistance of high-alloy steels to an industrial atmosphere was the subject of a well documented study by H. T. Shirley and J. E. Truman, of the Brown-Firth Laboratory, Sheffield, which Mr. Shirley presented.

He described tests designed to study the effects of composition and surface finish on the behaviour of higher alloy steels when exposed for prolonged periods to severely industrial atmospheric conditions, without attention to the cleansing treatment normally recommended. The intention was to provide information about compositions for use where regular cleansing would be impracticable, and to compare directly these higher alloy steels with lower alloy steels exposed under similar conditions.

There were 450 samples, covering 22 steels and 5 non-ferrous materials, all in sheet form. The three types of surface finish tested were pickled, emeried, and mirror-polished. Exposure was for two and five years with vertical specimens, and 5 years with specimens exposed at 12° to the horizontal.

Most Resistant

The behaviour of 18/8/2½ chromium-nickel-molybdenum and 24/12/3 chromium-nickel-tungsten steels was outstandingly good, and losses were of the order of only one thousandth those of mild steel. In general, the more resistant steels tended to show higher losses by the emeried samples. than by the other two surface finishes, the effect being small for the vertical exposure stands, but more considerable in the case of the horizontal stands.

Although comparison with earlier tests for one month and one year indicated a general tendency for higher rates of loss in the initial stages of exposure, there was no indication of any notable change in rate attack with time over the 2-year to 5-year periods.

The results for the non-ferrous materials were in line with those expected from previously published figures and showed all five materials to give higher losses than most of the special steels. Although in some cases this might be offset to some extent by pitting tendency in the steels, the outstanding superiority of the 18/8/2½ chromium-nickel-molybdenum and 24/12/3 chromium-nickel-tungsten steels was clearly demonstrated, their losses being of the order of only a hundredth of those of the non-ferrous materials.

Mr. Shirley pointed out that the hopes which had long been entertained of the development of a low alloy steel with very high corrosion resistance had faded, though such steels had in fact been developed with four times the corrosion resistance of mild steel. It was therefore necessary to look to the more highly alloyed steels to find the necessary corrosion resistance for use in severe conditions, in spite of their relatively high price.

Better than Silver

Mr. Turner said that the Atmospheric Corrosion Sub-Committee, of which he was chairman, had greatly welcomed Mr. Shirley's data, which they regarded as a most valuable contribution.

Some of the highly alloyed steels might not be "as good as gold" but they were certainly better than silver as regards corrosion. Even the earlier form of 18/8 corrosion resistant nickel-chromium steels had proved of great help. They had been used in the United States for Budd welded corrugated all-steel coaches. The earliest of these trains were now coming into the shops after many years' service and the stainless steel was in perfect condition.

It was therefore of importance that the markedly superior corrosion resistant steels, some of which stood out so clearly in Mr. Shirley's paper, might soon become available, and BISRA should take every possible step to make such materials available to industry here.

Dr. Vernon commented on the remarkably good results obtained from the low-alloy Ni-Cr-Mo steel. Although rusting was not suppressed, the efficiency, weight for weight, of the alloying elements, was even greater than for the higher-alloy steels. Mr. Britton confirmed that molybdenum additions to chromium nickel stainless steels improved their performance on exposure in railway tunnels —from 80 per cent of the surface pitted to a few scattered small pits.

Dr. J. C. Hudson, head of the BISRA Corrosion Laboratory, presented a paper on "The atmospheric corrosion of iron and steel wires." This described the results of tests on the corrosion of ferrous wires when exposed in an industrial atmosphere for periods of up to 10 years. The rate of corrosion did not vary appreciably with duration of exposure, but was effected by the diameter of the wire, being greater for thin than for thick wires. Certain wrought irons and low-alloy steels proved much more resistant than mild steel. In particular, three chromium-copper steels, containing from 0.6 to 0.9 per cent of chromium and 0.5 per cent of copper, showed a remarkable superiority over mild steel after 10 years' exposure in Sheffield, having suffered only from one-third to one-half of the loss in weight or tensile strength of the latter.

It was remarked, in the discussion which followed this paper, that every effort is made by enlightened engineers to encourage the use of these superior steels or to secure the adoption of superior anti-corrosion measures, but in general it was extremely difficult and often impossible to persuade the purchaser to look beyond the initial cost of the structure.

Mr. J. Dearden, the chief metallurgist at the scientific research department of the British Railways, London Midland Region, presented a paper on "Climatic effects on the corrosion of steel."

Rainfall No Guide

Exposure of specimens to the atmosphere in Derby over a number of years had been used in an attempt to correlate the corrosion of steel in a moderately industrial atmosphere with the hours of rainfall registered by a recording rain gauge. No such relation was found, as only 35-40 per cent of the total corrosion occurred during the hours when the rainfall was sufficient to register on the gauge. A further 35-40 per cent was due to the effects of humidity, and the balance is presumed to have occurred during periods of drizzle, not recorded as rainfall.

In a discussion, Dr. Vernon observed that the method adopted by Mr. Dearden had over emphasised corrosion due to rain and had correspondingly vitiated his estimate of the relative contributions of other weather factors. In industrial atmospheres rain was largely beneficial in washing off corrosive deposits.

Mr. T. Henry Turner welcomed Mr. Dearden's paper because much work was needed on micro-meteorology. The liability to corrosion must vary from street corner to street corner and not merely from country to country, depending on the locality of sulphur dioxide emissions from power houses and soot from houses.

During the afternoon session the following papers were presented and discussed: "The effect of shot peening upon the corrosion fatigue of high-carbon steel" (Dr. U. R. Evans, F.R.S.); "Corrosion fatigue of steel under asymmetric stress in sea water" (Dr. A. J. Gould, Sheffield University); "High-speed rotor tests of paints for under-water service" and "Electrochemical studies of protective coating on metals" (Dr. Wormwell).

Steel Needs in the Far East

WITH the exception of those of India, the existing plans of countries in the ECA Far Eastern region for the establishment of the iron and steel industry do not provide adequately for present or future requirements, states a recent report adopted by the Industry and Trade Committee of ECAFE at Singapore.

Among the principal causes of delay in carrying out plans is the shortage of finance, chiefly of foreign exchange, for the purchase of equipment.

The report noted that in four countries of the region—the Philippines, Indonesia, Ceylon and Burma—the plans called for development of iron and steel industry by re-melting scrap.

Japan has more than 4 million tons of scrap on hand, and would only consume an estimated 1.3 million tons a year.

Information from Pakistan indicates a shortage of scrap; India is stated to have a shortage of melting and re-rollable scrap.

The report recommended a survey of geological and industrial research laboratories in the ECAFE region, under governmental and private auspices—in Australia, New Zealand and Japan.

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Africa's New Leathercloth Industry

ANOTHER stage in the industrial development of South Africa was marked by the recent opening at Somerset West of the new African Explosives and Chemical Industries' paint and leathercloth factory by Mr. D. de Waal Meyer, secretary of the Department of Commerce and Industry. This is the first undertaking to make leathercloth in South Africa.

Technicians of Imperial Chemical Industries, Ltd. (which owns 50 per cent of the A.E. & C.I. capital), had been sent out to assist in the initiation of the scheme.

The new plant has been designed on most modern lines. The more inflammable types of manufacture, such as the special putties for the motor-car industry, are isolated in individual buildings to reduce fire risk. Paint factories cover an area of about nine acres, and have been equipped with the latest machinery at a cost of £250,000.

The factory is making specialised products such as Duco and Dulux, which were developed in America by E. I. du Pont de Nemours, Inc. Until production started at Somerset West, South Africa had to depend on imports for the increasing quantities of these products used.

The pigments and other raw materials still come from overseas. To make the 300,000 gal. of finishes that can be produced annually in a five-day week, much raw material must be imported.

Not all the leathercloth machinery has yet been installed, but the whole process of coating the base of cotton fabric with nitro-cellulose, softening with plasticisers and colouring with pigments will be carried out. The fabric will be grained or embossed by rollers, and can be given a gloss or matt finish as desired.

At the opening ceremony, Mr. D de Waal Meyer said that the devaluation of sterling in the U.K. was only likely to have an effect on the new plants in so far as it would be necessary to import raw materials from hard currency regions.

LETTER TO THE EDITOR

Survey of Chemical Industry

SIR,—It should be recorded that we are not one of the sixty non-members reported to have been consulted by the Association of British Chemical Manufacturers when preparing the above report for the Board of Trade.

Because we suspended manufacture of certain chemical products, for the very good reasons set out in our circular of February 2, 1948, and sold redundant plant and machinery, it does not follow we have retired and have no long term plans and probable lines of development.

We remain actively engaged in the production of barytes, an essential raw material extensively used in the chemical industry, and our freehold factory of 25 acres, with buildings, railway, electricity, gas and water services remains intact.

As is well known, our achievements over the past 20 years include the production of tens of thousands of tons of TNT and other toluene nitration products, barium chloride, ferric and ferrous chlorides, soda crystals, etc. Given the right conditions we see no reason why our factory should not again do equally well.—Yours, etc.,

ATHOLE G. ALLEN,
Governing director.
Athole G. Allen (Stockton), Ltd.,
Stockton-on-Tees Chemical Works.

PARLIAMENTARY TOPICS

IN a written answer to Sir W. Darling, the President of the Board of Trade (Mr. Harold Wilson) stated that Hyflo Supercel was the trade name for one type of diatomaceous earth imported from the U.S A. Diatomaceous earths were also imported from a number of other sources including France, Algeria, Spain, Kenya and Norway. Imports were on private account, and users had been for some time encouraged to use material from non-dollar sources. Imports from soft currency sources had, in fact, been on Open General Licence since October 5

REPLYING to a question from Sir Patrick Hannon, the Minister of Education (Mr. George Tomlinson) said that every effort was being made to encourage the interchange of technicians between the U.S.A. and this country. Some 200 applications had been received for the 50 vacancies available under the arrangements made with ECA for British scientists and technologists to study in America. Eight successful applicants had already gone to the U.S.A. Selection of the remainder to the number of about 40 was in progress, and it was hoped that they would leave in January next year. It was not possible rigidly to classify successful applicants.

The Chemist's Bookshelf

Organic Reactions. Ed. Roger Adams. London: Chapman and Hall. Vol. IV, pp. 428. 36s.

Volume IV of this well known series needs little introduction. The first volume appeared in 1942 and the series aims at covering the more important reactions which are likely to be encountered in any research project. Because each chapter dealing with a particular reaction is written by an expert in that field a great deal of information is provided concerning the utility of the method and the expected yields. An especially useful aspect of this series is the incorporation at the end of each chapter of a list of all known components which either undergo the reaction discussed or which have been prepared by it.

The Diels-Alder reaction, using maleic anhydride and other dienophiles, which has been widely used for the preparation of ring compounds and the investigation of certain natural products, notably sterols, is the subject of the first two chapters. Other sections deal with the preparation of amines by reductive alkylation, the formation of acyloins and of benzoins. It is of interest to note in the latter connection that some of these compounds were used by the Germans as therapeutic agents.

The concluding chapters cover the preparation of benzoquinones by oxidation, the preparation of aldehydes by the Rosenmund reduction of acid chlorides and the Wolff-Kishner reduction of carbonyl compounds to hydrocarbons. This volume forms a welcome addition to the series, whose previous high standards it well maintains.

A Bibliography of Dyeing and Textile Printing. L. G. Lawrie, A.R.I.C. London: Chapman & Hall, Ltd. Pp. 143. 15s. net.

Only once, it would appear, has there been provided a comprehensive bibliography concerned with the art of dyeing. That was prepared by Jules Garçon in 1893. The aim of the author of the present work is to provide, in concise form, information of value to the historian, scientific worker and practical dyer alike. His book is a guide, however, and only the broad outline of literature on dyeing and textile printing, embracing 816 relevant books in the past four and a half centuries, can be given. Part I is a list, in alphabetical order of authors, of books printed from 1500 to 1946; Part II gives a short title list of works in chronological order. There is a classified subject index which makes this handy volume a very ready means of reference.

Recent Advances in Organic Chemistry. (7th Edition). A. W. Stewart, revised by H. Graham. London: Longmans, Green & Co. Vols. II and III. Pp. 447 and 387. 35s. each.

Volume I of this series appeared first in 1908 and the material was subsequently expanded into two volumes. The publishers state that Volume I can no longer be regarded as dealing with *recent* advances in organic chemistry, being mainly of historical interest, and now out of print. The material formerly contained in Volume II is now reissued in modified and expanded form as Volumes II and III.

A similar statement might have well been made concerning the present volumes. There can be little excuse in a book purporting to deal with recent advances, for the inclusion of a discussion of Sugden's parachor (1924), Purdie's methylation of the sugars (1908) or much material on the terpenes which dates from the early 1920's. Details of some recent work have been incorporated as is instanced by a discussion of recent work on starch, pectin and alginic acid, while the chapters on vitamins and sterols have been brought up to date.

There is a definite place for an advanced textbook of organic chemistry which will review the recent advances in selected fields, but methods of presentation have changed, and rather than revising earlier editions it would seem better to produce a completely new book, along similar lines, where the author will not be restricted by previous traditions.

Technical Publications

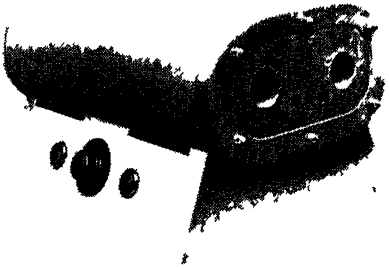
THE cutting of profiled shapes in steel, with a drawing as guide, by means of a serrated, electrically driven wheel has, until recently, depended for its accuracy on the skill of the operator. Now a device has been produced whereby the tracer wheel is controlled automatically: this is an electronically controlled oxygen cutting machine, the characteristics of which are described in a leaflet just issued by Hancock & Co. (Engineers), Ltd., of Croydon. The tracer is fitted to a profiling machine with the electronic tracer fitted to the side of the top transverse carriage; and the wheel, instead of engaging the drawing table, is in contact with the top of a cylinder which is mounted on the main lower carriage. A spot of light is projected downwards from a position adjacent to the tracer wheel, which impinges on a drawing on the drawing table.

* * *

THE second edition (1949) of the French publication, "Tables à l'usage des usines fabricant des acids mineraux (H_2SO_4, HNO_3 and HCl)," has just been issued by Etab. Kuhlmann, through l'Industrie Chimique, 8, rue de Miromesnil, Paris, 8. It has been compiled by Paul Gavelle, Directeur de Laboratoire Central d'Analyses des Etab. Kuhlmann, and contains about 60 quarto pages of tables and costs Fr. 250. Particular attention has been directed to aerometric and densimetric data, to densities, specific weight, and specific mass; matters concerning which, says the author, many chemists have forgotten the elements. Apologies are offered for still speaking of deg. Baumé, strictly and legally defunct since 1919, but still used by chemists in most branches of chemical industry. Hydrochloric and nitric acids have been included: (1) Brief historical survey of the Baumé densimeter and aerometer, with definitions of relative and absolute densities, sp. wts., and of specific mass; (2) strengths of solution of the three acids as a function of density and deg. Baumé; (3) tables whereby titres of manufactured sulphuric acids, either above or below the commercial standard, may be adjusted to that standards; and (4) tables relating to control of oleum distillation.

* * *

A FULL survey of laboratory and industrial heating appliances is afforded by six new publications issued by the General Electric Co., Ltd., London. The series includes indicating pyrometers and temperature controllers; laboratory type furnaces; and small workshop, high-temperature, melting, and horizontal and vertical furnaces, giving their specifications, dimensions and prices.



[Courtesy, The General Electric Co., Ltd., London

Double tube muffle (PH/M92) operating at temperatures up to 1000° C., suitable for analytical and works laboratories

* * *

SCIENTIFIC methods for the formulation of paints, processes of manufacture and application techniques depend upon trained and experienced staff. In order to supplement the training of its own employees, Imperial Chemical Industries, Ltd., Paints Division, prepared a short introductory guide to literature on the technique of paint application, and paint varnish and lacquer technology. As it is felt these lists are also of interest to its customers and business associates, revised editions may be obtained on application to I.C.I., Paints Division, Slough, Bucks.

* * *

IMPROVEMENT to the *p*H meter (type D.-303) are discussed by A. Cooper in the current issue of "Technique" (Vol. 3, No. 4), published by Muirhead & Co., Ltd., Beckenham, Kent, while the second feature by P. Wall Row is devoted to the rapid processing of photographic materials.

* * *

SOME of the wide variety of uses of ropes—ranging from towing cables for fishermen, and nets to catch pouches on mail lines, to the complicated system of ropes and pulleys in the flies of a modern theatre—are the subject of articles in "Rope Talks" (No. 22), just issued by British Ropes, Ltd., London.

Next Week's Events

MONDAY, NOVEMBER 7

The Royal Institute of Chemistry

Stockport: Central Library, 7 p.m. Dr. G. N. Dyson: "A System of Chemical Nomenclature."

Society of Chemical Industry

London: Royal Institution, Albemarle Street, W.1., 6.30 p.m. (Joint meeting of the London Section with the Food and Agricultural Groups). Jubilee Memorial lecture. E. B. Anderson: "The Cow: Mankind's Benefactress."

TUESDAY. NOVEMBER 8

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. (Joint meeting with the Low Temperature Group of the Physical Society). Three papers on "Heat Transfer at Low Temperatures."

The Royal Institute of Chemistry

Norwood: Technical College, 6.30 p.m. N. Booth: "Careers for Chemists." Second of four meetings for students and senior children. Brains trust.

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. J. Whitaker: "Industrial Ventilation."

Institute of Physics

Glasgow: University, 7 p.m. Prof. James Small. "Heat Pumps."

Hull Chemical and Engineering Society

Hull: (Joint meeting with Hull and District section, R.I.C.). T. Henry Turner: "Chemistry of Railways."

WEDNESDAY, NOVEMBER 9

The Chemical Society

Manchester: University. Symposium on "Some Chemical Aspects of Atomic Energy," introduced by Dr. R. Spence. Morning session, 10.30 a.m. J. S. Anderson: "The Place of Transuranic Elements in the Periodic Table." Afternoon, 2.30 p.m. G. B. Cook: "Recent Developments in Fission Product Chemistry"; E. Glueckauf: "Solution Chemistry of Uranium and Thorium." Evening, 5.15 p.m. W. Wild: "The Chemical Effects of Radiation."

Society of Chemical Industry

London: Imperial Institute, South Kensington, S.W.7. 6-9 p.m. Third conversazione of the Food Group. Informal reception by Sir Harry and Lady Lindsay.

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. E. Voce: "Recent Developments in Copper and Copper Alloys."

THURSDAY, NOVEMBER 10

The Chemical Society

Hull: University College, 6 p.m. (Joint meeting with Hull University College Scientific Society). Prof. N. K. Adam: "Surface Films."

North Wales: Bangor, University College, 5.30 p.m. (Joint meeting with University College of North Wales Chemical Society). Prof. Wilson Baker: "A New Type of Aromatic Compound."

Nottingham: University, 6.30 p.m. (Joint meeting with Nottingham University Chemical Society). Prof. M. Stacey: "Organic Compounds of Fluorine."

The Royal Society

London: Burlington House, Piccadilly, W.1, 2-30 p.m. Discussion: "Detonation," opened by W. G. Penney.

Institute of Physics

Manchester: Reynolds Hall, College of Technology, 6 p.m. (Joint meeting of the Illuminating Engineering Society and Manchester and District Branch). Prof. H. Hartbridge: "Recent Advances in the Physiology of Colour Vision."

Pharmaceutical Society

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. T. C. Denston: "The British Pharmaceutical Codex, 1949."

FRIDAY, NOVEMBER 11

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. (Joint meeting with RIC and SCI). Tilden lecture. Prof. E. R. H. Jones: "Acetylene and Acetylenic Compounds in Organic Synthesis."

Society of Chemical Industry

London: King's College, Strand, W.C.2, 7 p.m. (Fine Chemicals Group). Dr. D. W. Adamson (Wellcome Research Laboratories): "The Chemistry of Antihistamine and Related Drugs."

Royal Statistical Society

South Wales: Technical College of Monmouthshire, Crumlin, 7 p.m. D. R. G. Davies: "The Use of Statistical Method in Steel Plants in the U.S.A."

Oil and Colour Chemists' Association

Manchester: Engineers' Club, Albert Square, 6.30 p.m. A. R. Dunton and H. Hampson: "Recent Observations on Anti-Corrosive and Protective Finishes."

The Royal Institution

London: 21 Albemarle Street, W.1, 8 p.m. A. G. Gaydon: "Flame Spectra."

HOME

Commonwealth Sugar Conference

A conference to discuss long-term arrangements for the purchase of Commonwealth sugar by the United Kingdom is due to begin in London on November 21.

Science Laboratory Extension

Lancashire County Council recommends that £12,346 shall be spent on altering and extending the Forensic Science Laboratory at Preston.

New Works to Cover Overseas Trade

To cope with expanding trade with Australia, Brazil, Canada, New Zealand, etc., J. G. Jackson and Crockatt, Ltd., has moved from Glasgow to a new factory on the industrial estate, Nitshill Road, Thornliebank. The telephone number is now Giffnock 391 and the telegraphic address " Jackro, Thornliebank."

Oil Refineries' Big Component

Slung between two bogies and drawn by a lorry with a crew of seven, a 55-ton metal tube, 94 ft. long and 9 ft. in diameter, passed through the Mersey Tunnel recently on its way from Dukinfield, Cheshire, to Thornton-le-Moors, near Chester, where it will be used in the Shell oil refineries.

Man-power Decline in Coalfields

Man-power in the coalfields fell by another 1100 in the week ending October 22, the total figures showing a reduction from 724,400 to 709,500. Coal output last week was 4,405,100 tons, 45,200 tons less than the week before, although output per manshift reached a new level of 3.10 tons at the face and 1.20 altogether.

Housing Scheme Deferred?

Confirmation of the fact that I.C.I., Ltd., will not be able to realise in its entirety its scheme to create for workers an estate of 1000 houses near Huddersfield is contained in the group's offer to sell to Huddersfield corporation land it acquired for building at Bradley. The town clerk has been authorised to purchase the land at a valuation.

Steel Records

For the week ended October 22, steelworkers of John Summers & Sons, Ltd., created a record in local steel output. At Hawarden Bridge works, Shotton, 11,192 tons of steel ingots were produced, while the Shelton works at Stoke-on-Trent turned out 5484 tons. These tonnages had never previously been reached at the Shotton or Shelton works.

Fire at Iron Foundry

Damage estimated at £2000 was caused by a fire last week at the foundry of James Smethurst & Sons, Ltd., Warrington, which caused the roof to collapse.

Norwegian Research Council

The post of administrative director of the General Scientific Research Council (Norges Almenvitenskapelige Forskningsrad) is advertised as vacant; applications must be received in Oslo by November 20.

University Chemistry Expansion

The chemistry department of Glasgow University is included in the £500,000 extension planned by the authorities. This information was given recently by the principal when he detailed the various extensions and improvements involved within the University.

New Rates for Zinc and Oxide

A Ministry of Supply Press notice on October 28 calls attention to the fact that zinc oxide manufacturers would raise prices of zinc oxide by £1 15s. from that date. The new prices are: Red Seal, £80 15s.; Green Seal, £82 5s.; White Seal, £83 5s. Another Ministry bulletin issued at the same time indicated that Government prices for good ordinary brand zinc metal would increase on the same date by £2 per ton delivered—to £83 10s.

Tightening Control of Pollution

The minimising of river pollution in the Scottish Borders has been carried a stage further by the River Tweed Commissioner, who has now submitted reports on samples taken near Kelso and Melrose. These disclose a considerable amount of pollution from sewage discharge and the County Council is taking up the matter. It is expected that all sources of pollution will be dealt with, including industrial effluents.

Plastics Technicians Fly to India

Following the sale by Tenaplas, Ltd., the extruded plastics manufacturers, of Upper Basildon, Berkshire, of £60,000 worth of plastics extrusion machinery to the Mysore government for a new factory in Bangalore, three Tenaplas technicians flew to India from Heathrow airport on November 1, to help set up the machinery and put it in running order. They have three months' leave of absence, and their return fare by plane and their expenses during three months in India are being paid by the Mysore Government.

PERSONAL

MR. J. B. CALDWELL has been awarded the research scholarship in the application of light alloy to ship construction (£400 a year for two years), presented by the Aluminium Development Association.

A presentation of an inscribed silver cigarette box was made last week to MR. VICTOR BLAGDEN by members of the British Chemical and Dyestuffs Traders' Association as a token of their affection and esteem. The ceremony marked the retirement, earlier, of Mr. Blagden from the presidency of the association, a position which he had held with distinction for 26 years. In 1944 he was presented with his portrait in oils, and this now hangs in the board room of the association.

Following his resignation as director of engineering for the U.S. Atomic Energy Commission, MR. ROGER S. WARNER has joined the staff of Arthur D. Little, Inc., Cambridge, Massachusetts, research and engineering organisation. Mr. Warner was in charge of initiating the Commission's post-war construction programme, developing improved chemical processes, such as those for the recovery of uranium and plutonium, and disposing of radioactive wastes. He was also in charge of technical operations for the Bikini atomic bomb tests, and from 1944 to 1947 had been director of the Los Alamos Laboratory's ordnance division, which handled engineering design, assembly and testing of the early atomic bombs.

DR. CHARLES GLEN KING, scientific director of the Nutrition Foundation, New York, and professor of chemistry at Columbia University, is to receive the medal and $1000 John Scott Award of the City of Philadelphia for his "outstanding work on the chemistry of vitamin C." Dr. King has won world-wide recognition for his contributions to the isolation, chemical identification, and synthesis of vitamin C (ascorbic acid), for his studies of enzymes and his work on the molecular structure of sugars and fats. The award was bequeathed in 1816 to the City of Philadelphia with the sum of $4000 by John Scott, an Edinburgh chemist. By 1917 the fund had grown to $100,000 and a court order was obtained permitting the distribution of premiums larger than the original $20.

THE TEXTILE INSTITUTE

ELECTION of two new Fellows and seven new Associates has been announced by the Textile Institute.

The Fellows are MR. COLIN GARRETT, who has been responsible for many processes and investigations in the chemistry and practice of bleaching and dyeing, and MR. HERBERT EDWIN GARTSIDE, who has introduced several modifications of textile machinery.

Elected Associates are:—Alfred Ernest Walsh, Albert Glover & Sons, Ltd., Morley; Frank Henry Seal, Staple Fibre Department, British Celanese, Ltd.; Robert James Sheddon Linn, Courtaulds, Ltd.; Bela Fehertoi, Hungarian Textile Industry, Department of Rationalisation; Homi Darashaw Lentin, J.K. Cotton Spinning and Weaving Mills Co., Ltd., Cawnpore, India; Keshow Ranjan Prasad Sinha, The Delhi Cloth and General Mills Co., Ltd., India; Duncan Ernest Moffat, Kaiapoi Woollen Manufacturing Co., Kaiapoi, New Zealand.

Obituary

PROFESSOR EMERITUS THOMAS SLATER PRICE, whose death, at the age of 74, was reported last week, was formerly professor of chemistry in the Herriott-Watt College, and held the chair of chemistry, Edinburgh University, from 1931 until his retirement in 1940. Born in 1875, the professor was head of the chemical department of the Technical College, Birmingham, from 1903 to 1920, and for the following ten years he was director of research of the British Photographic Research Association. During the 1914-18 war, Prof. Price gave outstanding service as naval representative on the chemical warfare committee. He had been vice-president of both the Institute of Chemistry and the Chemical Society.

The death was announced last week of DR. JACK ARNOLD SCHEDLER, technical manager and director of the Clayton Aniline Co., Ltd. The doctor, who was 49, joined the company as a chemist in November 1924. He became a departmental manager in 1940, and assistant technical manager six years later. His father, Dr. Arnold Schedler, a former Swiss Consul in Manchester, had also served the company as technical manager and director.

OPPOSITION TO STANDARDS SCHEME IN SOUTH AFRICA

Duty Free Rhodium Trichloride?

From OUR CAPE TOWN CORRESPONDENT

OPPOSITION is being offered from several quarters of South African industry to the relatively high charges being imposed for the use of the new certification and marking schemes sponsored by the South African Bureau of Standards. For example, members of the paint, disinfectant, petroleum jelly and allied industries say they will not ask for the assistance of the bureau or accept the mark—the elliptical sign with "S.A.B.S." inscribed. The S.A. Polish Manufacturers' Association wants the fees reduced before any of its members will co-operate. One polish manufacturer says that, on the present terms, he would have to pay £6000 a year for the privilege of using the mark. He suggests that a flat rate of a few hundred pounds a year would be quite enough for the service.

A chemical manufacturer says that some time ago, when the bureau was ready to prepare specifications for the products he makes, he was asked to advise on the way charges should be fixed but, when they were finally gazetted, they were too high. He says he will not take the mark if it means that representatives of the bureau can inspect his factory to check on him, which is "policing of private enterprise by the Government." Actually, few chemical or allied firms have taken the mark, he says. Two have done so for DDT products and two for re-refined oils.

* * *

When the abattoirs at Maitland, Cape Town, are modernised the Meat Board may initiate a new system of spray-drying blood, which will increase its value as a by-product. At present a vast quantity of blood is processed in roller driers, which produce a coarse material suitable only for fertiliser and animal feed. When the new principles of spray-drying are used, various products for human consumption can be made, it is stated. Regarded as the most important is blood plasma powder, used by the baking industry as a substitute for egg albumen, and by sausage manufacturers as a flavouring. One big fishing firm in Cape Town is using a spray-drier to extract vitamin B from its by-products.

Cement production in the Union remains on a high average level. New plants scheduled to reach the production stage towards the end of this year will probably fill the gap between present-day requirements and the available supply.

Cyanide is now being manufactured by a recently established division at Klipspruit, of a prominent firm of chemical manufactures.

* * *

In the near future, dependent on the arrival of machinery, leathercloth of all qualities, colours and designs will be made in the Somerset West plant of African Explosives and Chemical Industries, Ltd. Up to the present, output has been undertaken on a limited scale. The material is stated to be in every respect identical with that made in the leathercloth division of Imperial Chemical Industries. In the same factory I.C.I. type Damasclene nitrocellulose coated material is being made. They will shortly be available in a wide range of colours. It is also planned to undertake the manufacture of a PVC coated fabric known as Vynide. This is to be given a tougher coating than the Rexine (*see page* 641).

* * *

An application has been received by the S.A. Board of Trade and Industries for the free admission of rhodium trichloride for the manufacture of a catalyst in producing calcium cyanide. Rhodium trichloride is dutiable under tariff item No. 335 at 10 per cent, ad valorem, while calcium cyanide is admitted free of duty. Under another tariff schedule, certain catalysts used in making sulphuric and nitric acids, viz., vanadium mass, and platicised asbestos mass, are admitted under rebate of duty. Rhodium trichloride is used in conjunction with platinum chloride, which is admissible free of duty, to produce a platinum-rhodium catalyst mass for making hydrocyanic acid, which is subsequently absorbed in lime to form the calcium cyanide. The rhodium-platinum catalyst mass is thus used in the first stage of the manufacture of cyanide. The equipment for a large cyanide plant has been received and has begun production.

OVERSEAS

W. German Potash Exports

An export quota fixed at 100,000 tons of potash for the year 1949-50 has been allowed to Western Germany. This represents almost double the amount of potash exported at present. Value of the 1949-50 exports is estimated at $10 million.

Germany Doubles Chemical Export Value

An increase of almost 100 per cent in the value of German chemical exports has taken place during the past year. The value of chemical exports from bizonal Germany through the Joint Export-Import Agency in the first half of this year was equivalent to $4,466,000 monthly, compared with a monthly average of $2,265,000 in 1948. This is recorded by the U.S. Department of Commerce.

Italian Cellulose Experiments

The Italian Ministry of Industry is striving to develop the use of straw in paper manufacture. Some 100,000 tons of surplus straw are available yearly in Italy and it is calculated that about 50,000 tons of cellulose could be produced. The State Experimental Centre has been conducting a series of experiments to raise the quality of the cellulose and a suitable technical process is about to be completed.

Thistle Substitute for Linseed

Oil suitable for use as a substitute for linseed oil in paint manufacture, has been extracted from the saffron thistle in New South Wales. A report, by the State Department of Agriculture, stated that the thistle yields 20 gal. of oil to a ton of seed. Linseed yields approximately 70 gal. of paint oil to the ton. Tests on the thistle were conducted by Harold Meggett, Ltd., of Sydney, one of the largest Australian paint materials manufacturers.

Italian Gas Engineering

The new pipe-line for methane at Marghera is the first instalment of the line which is to reach also Venice and Murano and Treviso. The new line differs from its predecessors in Italy, the stretch from Contarina to Mira Taglio (56 km.) consisting of 10-in. pipes, instead of 7-in. All these underground pipes are of steel, electrically welded, and protected against corrosion. The maximum capacity is 900,000 cu. m. a day. Several large industrial firms, such as Pirelli, Dalmine, Marelli, and municipalities like Padua, Verona and Rovigo, are transforming their plants to use methane instead of coal.

Italy's Brown Coal

During the first nine months of the current year 729,813 tons of Sulcis coal were extracted in Italy. This represents an increase of 12,254 tons above the corresponding period of 1948, but is less than in 1947.

British Fan for Chilean Mine

A four stage axial-flow ventilating fan, weighing 130 tons and claimed to be the most powerful of its kind in the world, will shortly be dispatched from the Pagefield ironworks of Walker Bros., Wigan, for delivery to the Schwager coal mine, Valparaiso.

State Monopoly for Medical Supplies

A Bill to enable the State to take over the import and wholesale trade in medical supplies will be one of the first matters to be considered when the new Norwegian Parliament meets in January. It is proposed to set up a State Medical Depot which would control prices and maintain a strict watch on quality.

Big Investment for Orlon

E. I. Du Pont de Nemours & Co., states a *Reuter* report from Wilmington, U.S.A., is to spend the equivalent of £7,860,000 on the new synthetic fibre, Orlon, which will go into commercial production late next year The new fibre will be spun into hoods for cars, tents, tarpaulins, fibre cloths, curtains and to form a variety of industrial fabrics.

Fibreglass For Oil Pipes

As a result of technical discussions and trials, large quantities of Fibreglass staple tissue have been applied as a protection to pipe lines in the Middle East. The largest single use so far, is that of the Iraq Petroleum Co. on its 16-in. pipe connecting Kirkuk with Tripoli, a distance of about 600 miles. When completed, some 14 million sq. ft. of Fibreglass staple tissue will have been used.

Aluminium Production Record

The average daily rate of production of primary aluminium in the U.S.A. during May was the highest since 1944, and the total of 56,909 short tons for the month established a post-war record. Reflecting both lowered demand and increased level of production, inventories at reduction plants were more than doubled during the month. Stocks at the end of May reached 24,634 short tons, the largest since October, 1947.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Arkwright Chemicals, Ltd., London, S.W. (M., 5/11/49.) October 10, £950 mortagage, to T. C. Whittaker, Manchester; charged on 82 and 84 Clopton Street, Hulme, Manchester. *Nil. December 25, 1948.

East Riding Chemical Co., Ltd., Hull. (M., 5/11/49.) October 7, £1000 (not ex.) and £2500 (not ex.) charges, to Lloyds Bank, Ltd.; charged on land with factory and other buildings at Ryde Avenue, Hull, and dwelling-house and sale-shop 26 and cottages 18, 20, 22 and 24 Wilson Street, Anlaby. *Nil. February 14, 1949.

Ferrand Luttmer Plastics, Ltd., Felpham. (M., 5/11/49.) October 6, £800 debenture to C. E. W Ferrand, Chichester, and £1500 debenture, to G W. Ferrand, Chichester; general charges.

Southern Metallisers, Ltd. (formerly Wessex Metal Sprayers, Ltd.)., Fareham. (M., 5/11/49.) October 11, £700 debentures, part of a series already registered.

Satisfactions

Great Bridge Oil Co., Ltd. (M.S., 5/11/49.) Satisfaction of £1500, registered February 27, 1939.

Tyborite, Ltd., Cheam, plastic manufacturers, etc. (M.S., 5/11/49.) Satisfaction, October 10, of mortgage and charge registered November 1, 1948

New Registrations

Aerial Spraying Contractors, Ltd.

Private company. (474,175). Capital £5000. Contractors for the spraying and treatment of land and growing crops by fixed wing aircraft, etc. Directors: F. S. Collins, Mrs. P. M. Moffatt. Reg. office. 115B High Street, Boston.

Ashton Products (1949), Ltd.

Private company. (474,325.) Capital £1000. Objects: To acquire from W. S. Ashton, R. L. Okell and H. Rawlinson, the assets of the business carried on by Ashton Products, Ltd. (in voluntary liquidation), manufacturers of insecticides, detergents, etc. Directors: W. S. Ashton, R. L. Okell, H. Rawlinson and J. S. Rimmer. Reg. office: 3 Church Road, Garston, Liverpool 19.

Ferro-Betol, Ltd.

Private company. (474,342). Capital £10,500. Manufacturers of oils, paints, pigments, varnishes, chemicals, etc. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

E. F. Galton and Co., Ltd.

Private company. (474,259). Capital £1500. Manufacturers of chemicals, detergents, solvents and fatty alcohols, oils, etc. Secretary: W. E. D. Smedley. Reg. office: 36 Southampton Street, W.C.2.

Company News

Staveley Coal & Iron Co., Ltd.

Progress of the subsidiary companies of the Staveley Coal & Iron Co., Ltd., which include the recently formed Staveley Iron & Chemical Company, was reviewed recently by the parent company's chairman, Mr. David N. Turner.

During the past year approval had been given in principle by the Iron and Steel Board to the scheme for the improvement of blast furnaces and by-product plants. New coke ovens were also to be built.

Output of pig iron, 22,000 tons in excess of the previous year's figures, was an all-time record. A record quantity of tar had also been distilled—3000 tons more than last year.

Increases of Capital

The following increases in capital have been announced:—Chemical & Petroleum Investments, Ltd., from £200,000 to £300,000. William Blyth & Co., Ltd., from £250,000 to £500,000. Liverpool Borax Co., Ltd., from £65,000 to £95,000.

The Stock and Chemical Markets

STOCK markets have not recovered from the heavy selling of British Funds which developed last week and brought 2½ per cent Treasury Bonds ("Daltons") and nationalisation stocks down to new low levels. The fall in Gilt-edged affected leading industrials which moved rather lower as a result.

Rising costs of materials, etc., following devaluation of the £ mean that many companies may have to face reduced profits as a result and their shareholders accept lower dividends.

Chemical and kindred shares have reflected the general trend, moving back towards the end of last week, and since becoming firmer and rallying moderately. Imperial Chemical are changing hands around 42s. 9d. at the time of writing. Monsanto are steady at 51s. 3d., with Brotherton at 20s., Fisons 28s., Burt Boulton 24s. 6d., Laporte Chemicals 5s. ordinary at 9s. 3d., Lawes Chemical 9s. 4½d., Albright & Wilson 30s 3d., and British Glues & Chemicals 4s. ordinary remain at 18s. Turner & Newall eased to 73s., and United Molasses to 37s. The 4s. units of the Distillers Co. have been fairly well maintained at 25s. 6d., but British Xylonite fell sharply to 62s. 6d. on the unexpected halving of the interim dividend to 2½ per cent. Other shares of companies connected with plastics became easier, De La Rue being 20s. 9d., British Industrial Plastics 2s. shares 4s. 9d., and Kleemann 9s. 3d.

In the metals market, British Aluminium have come back to 40s., although helped by the trend in dollar stocks, and International Nickel changed hands up to 58⅛. Shares of companies with important interests in the U.S. tended to remain firm, particularly Borax Consolidated at 57s. 6d. Elsewhere, General Refractories changed hands at close on 22s., while Glaxo Laboratories remained under the influence of the share bonus and were higher on balance at £18¾, after an earlier decline.

Iron and steel shares turned generally easier. United Steel have eased to 24s. 9d., Stewarts & Lloyds to 52s. 3d., Hadfields to 24s. 9d., and Dorman Long to 27s. 9d.

In other directions, Boots Drug have been active around 48s. 6d., Sangers were steady at 21s. 9d., with Beechams deferred better on balance at 13s., and Griffiths Hughes 18s. 6d. Lever & Unilever have eased to 41s. 6d. Oil shares failed to hold earlier gains.

Market Reports

THERE have been no important price changes during the past week for industrial chemicals and market conditions, although little altered, have a more settled appearance than at any time since the devaluation of sterling. The movement to the home consuming industries continues to be fairly substantial and in some directions buyers are showing more interest in covering future requirements. A steady export trade is reported from most sections and a good volume of new inquiry is in circulation. The demand for the potash chemicals, particularly carbonate and caustic, is good, while a steady outlet is maintained for the general run of the soda compounds. The call for the white and red leads continues steady. Other items in good request include the barium compounds, hydrogen peroxide and formaldehyde, while acetone and acetic anhydride are receiving fair attention. Conditions for the coal tar products remain uncertain but reports indicate an increasing interest. The demand for pitch is good at competitive prices.

MANCHESTER.—Fairly satisfactory trading conditions have been reported in most sections of the Manchester chemical market during the past week. Light and heavy products found a steady demand, against contracts, for home consumption and a fair amount of new business in many categories has lately been placed here. There has also been a fair flow of new inquiries from export markets. There has been little price movement.

GLASGOW.—Conditions in the Scottish chemical market have been unsettled because of the uncertainty of prices of many materials. This particularly applied to materials of which the price is affected by Government control of metals. There has been a heavy demand for petroleum jellies and oils of various descriptions in anticipation of the rise in price of these materials which has now been advised. The export market has been a little more active, receiving considerably more inquiries from the dollar areas. Reports on the possibilities of business in materials previously not competitive are not yet complete, but there are indications that a number of Scottish-produced materials will now find a dollar market.

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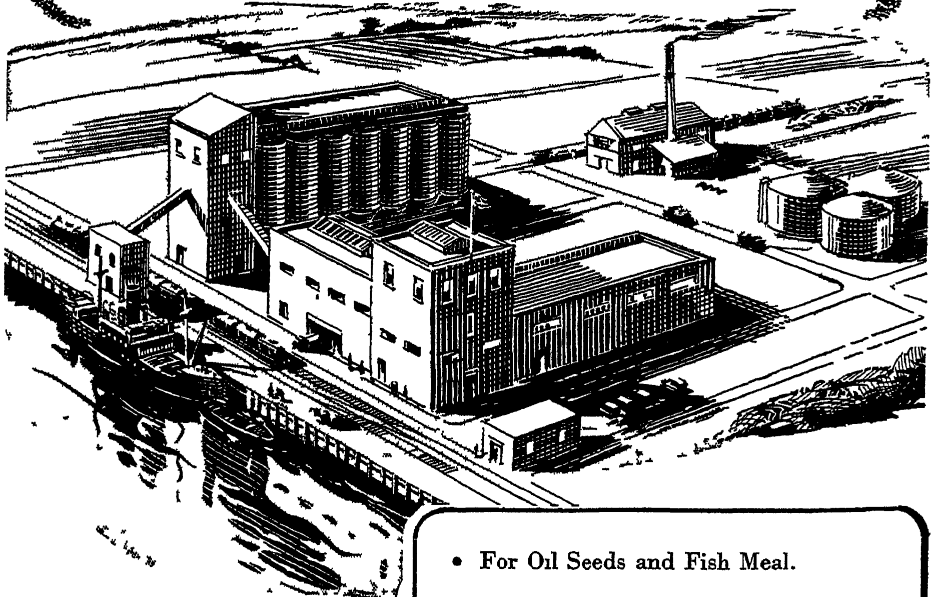

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process of preparing a copolymer of vinylidene chloride.—Dow Chemical Co. June 2 1939. 629,137.

Methods of preparing alkylorthosolicates.—British Thomson-Houston Co., Ltd. June 19 1946. 629,138.

Emulsification and emulsifying compositions.—Shell Refining & Marketing Co., Ltd., P. J. Garner, and P. A. Winsor. June 23 1947. 629,139.

Piperidine derivatives.—Roche Products, Ltd. July 8 1946. 629,196.

Stabilised vinyl halide compositions.—B. F. Goodrich Co. March 1 1941. 629,142.

Rubber-like compositions.—Harvel Corporation. Aug. 17 1945. 629,145.

Production of ketones.—Courtaulds, Ltd., and D. L. Tyler. Oct. 31 1947. 629,211.

Synthetic resins and the production thereof.—J. E. Lennard-Jones, F. G. Willson, J. Pearson, F. A. Paine, and J. Vaughan. May 23 1944. 629,584.

Apparatus for delivering measured quantities of liquid.—P. O'Malley. Nov. 24 1945. 629,587.

Heavy duty lubricating oil compositions.—F. B. Dehn. (Union Oil Co.). Dec. 9 1944. 629,525.

Injection moulding of thermoplastic materials, particularly in the production of electrical insulation.—British Thomson-Houston Co., Ltd., and H. E. Cox. Jan. 10 1945. 629,645.

Process for the production of salts of phenol-aldehydes condensates.—C. J. Pedersen. Dec. 30 1944. 629,467.

Appparatus for measuring thicknesses.—G. Jacot, and J. Monti. May 15 1945. 629,648.

Production of cyclohexane.—I.C.I., Ltd., J. G. M. Bremner, and R. K. F. Keeys. March 29 1946. 629,405.

Preparation of materials having vitamin E activity.—Distillation Products, Inc. April 23 1945. 629,649.

Cellulose styrene compositions and methods of making the same.—Standard Telephones & Cables, Ltd. June 30 1945. 629,469.

Peroxides of sodium and/or potassium and method of making the same.—Mine Safety Appliances Co. Dec. 1 1944. 629,406.

Polishing metal surfaces.—A. D. Little, Inc. Feb. 2 1943. 629,603.

Apparatus for measuring electrically, properties of powdered, granular and like materials.—Marconi Instruments, Ltd., and J. A. Hampson. June 28 1946. 629,407.

Process for the preparation of aliphatic amino - polymethylene - carboxylicacid - amides.—Algemeene Kunstzijde Unie N.V. Nov. 13 1945. 629,534.

Production of complex zinc compounds and their application.—H. R. Frisch. Aug. 19 1946. 629,654.

Nitrogen and sulphur containing beta-substituted carboxylic acids and method of making same.—B. F. Goodrich Co. Oct. 5 1945. 629,537.

Manufacture of 2-tertiaryamino pyrimidine.—Pyridium Corporation. June 26 1946. 629,471.

Process for the production of penicillin.—Heyden Chemical Corporation. July 12 1945. 629,662.

Dispersion of rubber latex compounding ingredients.—Firestone Tyre & Rubber Co. Dec. 6 1945. 629,663.

Cellular thermoplastic materials.—Telegraph Construction & Maintenance Co., Ltd., H. F. Wilson, and D. E. Partington. Dec. 2 1946. 629,668.

Production of slots or holes in sheets of thermoplastic material.—F. Watson. (Kasy A/B.). Dec. 5 1946. 629,474.

Manufacture of metallisable monoazo dyestuffs of the pyrazolone series.—R. M. Hughes. (J. R. Geigy A.G.). Dec. 24 1946. 629,412.

Injector device for raising liquids containing matter in suspension.—E. Ventura. Sept. 30 1944. 629,477.

Production of antibiotic agents.—Abbott Laboratories. Feb. 14 1946. 629,479.

Process for the manufacture of pentaenes.—Roche Products, Ltd. Feb. 27 1946. 629.414.

Production of resinous materials.—Harvel Research Corporation. Oct. 7 1942. 629,481.

Radioactive units and method of producing the same.—United States Radium Corporation. Aug. 15 1941. 629,415.

Separation of alumina values from phosphorus-contaminated bauxite material.—Aluminium Laboratories, Ltd. Mar. 21 1946. 629,630.

Butt-welding of metal members by fusion and pressure.—Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procèdes G. Claude. March 23 1946. 629,687.

Spray-producing and atomising means.—W. H. Walton. March 14 1947. 629,686.

Production of heterocyclic nitrogen compounds.—E. I. Du Pont de Nemours & Co. March 27 1946. 629,482.

Cyclic acetals of pentaerythritol and their derivatives.—Geigy Co., Ltd., H. Jones, and J. K. Aiken. April 10 1947. 629,691.

Manufacture of organosilicon amines.—Corning Glass Works. May 16 1946. 629,483.

Continuous crystallisation.—E. P. Newton. (Koppers Co., Inc.). April 28 1947. 629,417.

Methods and compositions for treating metal surfaces.—American Chemical Paint Co. April 26 1946. 629,562.

Oxidation of hydro-carbons.—Distillers Co., Ltd., H. M. Stanley, K. H. W. Turck, D. C. Quin, G. P. Armstrong, and T. Bewley. May 1 1947. 629,637.

Production of selenomercaptans.—California Research Corporation. May 13 1946. 629,638.

Process for preparing high viscosity polyvinyl alcohol and the high polyvinyl alcohol resulting from said process.—Shawinigan Resins Corporation. Nov. 20 1946. 629,695.

Handling of carbonaceous solids.—Standard Oil Development Co. Nov. 22 1946. 629,696.

Methods of preparing dimethyl silicone gums.—British Thomson-Houston Co., Ltd. June 11 1946. 629,642, 629,486.

Patent Rights in Japan

APPLICATIONS may now be made for the restoration of patents, utility models and design registrations (but not trade marks) which existed in Japan on December 7, 1941, or were granted thereafter on applications made before that date and the reinstatement of such applications which were not proceeded with.

If the original grant or registration is restored and no application made for extension of its normal term, the proprietor may claim compensation in respect of any use from December 7, 1941, to the date of restoration. Alternatively, the proprietor may elect to accept an extension equivalent to the period during which he was unable to exercise his normal rights. Administration is being provided by the United Kingdom Reparations and Restitution Delegation, Tokyo.

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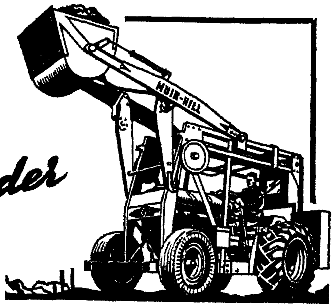

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Volume LXI 12 November 1949 Number 1583

The Scope for Simplification

AS manufacturers and especially as consumers, the chemical industries are directly interested in the potential advantages of further simplification in industry. The qualifying adjective is used advisedly, because simplification is far from being a revolutionary development for British industry. Motor car manufacturers, for example, have already achieved a degree of simplification which would have seemed almost fantastic in the days when the different models available were almost as numerous as the cars on the road. The fact that British standard specifications are used throughout the Commonwealth and elsewhere is in itself a monument to simplification; for standards, standardisation, simplification and specialisation are all very closely linked. British industry is not, therefore, being invited, in the Lemon Report,* to throw over traditional policy for a new system conflicting with the national outlook and industrial principles, but simply to consider the advantages to be gained by the more intensive application of the basic principles governing the development of all large modern industries. Economic circumstances are producing a growing tendency towards specialisation; the issue now is to decide to what extent this tendency might advantageously be stimulated.

The case for simplification has been ably presented by the almost simultaneous publication of the Anglo-American Council's report, "Simplification in Industry," and the report of the Lemon Committee on the standardisation of engineering products. As large buyers of engineering equipment and stores, the chemical industries could derive considerable benefits from some of the economies which might be effected by eliminating needless variety and simplifying products and materials. A valid example given by the Lemon Committee cites the metal box or can industry, in which considerable progress in standardisation has already been achieved. The committee was advised that the standardisation of paint tins, which the industry carried out in close collaboration with the paint trade, reduced an inordinate number of containers to five significant sizes based on the most economical use of tinplate. This involved a decision to pack paint by volume rather than by weight. The most significant result of these innovations was a saving estimated at

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* "Report of the Committee for Standardisation of Engineering Products" (chairman Sir Ernest Lemon); H.M.S.O. post paid 10d.

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£100,000 passed on to the paint trade by two factories of one metal box manufacturer alone. That cut in costs is, of course, the crux of the matter in both these recent reports in support of a principle which at any other time might have been condemned as a short cut to stultification of initiative. Some such case can be argued with some force now. The answer is likely to be that extreme circumstances sanction extreme measures. Whatever fruits of innovation and experiment temporarily are lost must be reckoned as a fair price to pay for a policy which can help so substantially the campaign to render United Kingdom goods truly competitive wherever labour and market conditions permit.

Existing prejudice against simplification derives largely from the fear of losing customers through inability to supply a particular size or type required. It is safe to assume that customers, as a whole, are unlikely to nourish lasting grievances or to transfer their business elsewhere, once they discover that purchases of regular products are saving their competitors the large sums that can be pruned in this way. Chemical and petroleum industries have already taken positive steps to stimulate standardisation in relation to their complex requirements of engineering stores and plant. It is also noteworthy that petroleum equipment manufacturers were among the sections of the engineering industry with which the Lemon Committee held discussions.

Unquestionably the systematic application of simplification and standardisation is capable of bringing about an appreciable reduction in the cost structure of British industry. The effects are cumulative. The chemical industries, for example, can be saved large sums by simplification of the engineering products of which large sections make common use. While a vigorous chemical industry can quite obviously not be confined to certain standardised lines, the good results of prudent specialisation find convincing evidence in the unqualified commercial success of the large chemical groups. Concentration of energy in certain sharply defined directions is common to them all.

Price incentive is, of course, the most powerful inducement which manufacturers can offer for the purchase of lines in regular production. Special designs in the fabricating industries will always be required for particular purposes, but

(*continued at foot of page* 658)

Notes and Comments

CRL Objectives

THE current report on the work of the Chemical Research Laboratory in 1948 differs from most of its annual predecessors by the indications that it contains that some progress is at last being made towards the achievement for a long cherished ideal. That was the aim, so often deferred, to free this branch of the Department of Scientific and Industrial Research from its rôle of maid-of-all-work to industries at large sufficiently to allow the following up of conspicuous research clues not directly associated with current production requirements. That does not imply that the bulk of the subject matter is not still obviously utilitarian in objectives. The valuable additions to technology now recorded by such sections as the Corrosion of Metals Group, the useful programmes of the new (July, 1948) High Polymers Committee and the Pure Metals Committee are evidence to the contrary. There is, however, now a new note represented by the brief commentary given on innovations in fields such as atomic energy, stable isotopes and some incursions into more fundamental aspects of newer materials, from which the more widely varied developments are likely to stem. The changing outlook of CRL is confirmed by some of the comments in the report of the Chemistry Research Board, over the signature of its chairman, Professor Sir Norman Haworth. That report affirms the intention to study " basic, long-term problems of chemistry and chemical technology of a type which requires the attack of a skilled team over a long period." This introduces another problem, the risk of duplication of the work of universities and some industrial centres. That, observes the board, " may be unavoidable and even desirable." Those who hope to see the present expansion of chemical science and technology continued in the 1950's will applaud the present policy and trust that economic emergency does not deflect the CRL from it.

Changing Patents Procedure

AN agreement in 1948 between France, Belgium, Luxemburg, and Holland to institute an international bureau for determining the originality of patents is now being ratified. It is expected that the bureau will begin work sometime next year. There is much speculation in France as to what will be the repercussions on the patents situation. Will the International Bureau confine itself to announcing priorities or will it pass judgment on the admissibility of specifications? In the latter case, it is being asked to what extent would the bureau's opinion be taken into consideration by French tribunals. The subject, of evident importance to chemical research interests in France and elsewhere, cannot be entirely independent of the project, at present in the provisional stage, for a convention for the creation of a European Patent Office authorised to deliver, after examination of priorities, a European certificate of invention. This was recommended during the 1949 session of the Council of Europe, at Strasbourg. It is thought in France that it would be advisable to continue the examination of this project, the implementation of which is still meeting with numerous practical difficulties, in close co-operation with the bureau recently established at The Hague.

Fertiliser Facts

THE failure of artificial fertilisers to smooth out all the shortages in human nutrition, as some optimistic thinkers in the last century firmly believed they would, is much less the fault of the chemical plant foods themselves than of the relatively meagre use, even now, that is made of them and the frequency with which they are misused. Disregarding the grosser sort of errors in the application of chemical plant food—and they are not uncommon even here—the amount of wastage attributable to lack of precise knowledge about availability and absorption by plants is almost certainly adding very largely to the amount of good material that is used to no good purpose. That is basically the problem which has evoked some very promising results of research in the U.S.A. America has, of course, no monopoly of work in this field; but, as it publishes significant results with alacrity and is making full use of radioactive materials from the Oak Ridge Laboratory, much of the credit for what is now being done to "tailor" artificial and mineral manures to serve particular needs is being given to the U.S. Department of Agriculture.

Tracer Evidence

ROCK phosphate, irradiated in the Oak Ridge pile, is the source of most of the clues now being documented regarding what happens to certain fertilisers under differing soils and crops. The problem is far from new, but knowledge has hitherto tended to be of the empirical sort. The U.S. workers seem now to have firmly established that the activity of rock phosphate as a source of phosphate is regulated by the *p*H of the soil, and where this is exceptionally high the take-up of the added phosphorus is almost inhibited. A further phase of the experiments, of which this first "greenhouse" series has recently concluded, yields a further testimonial to superphosphate. Applied in a mildly acid soil (*p*H 5.8), superphosphate yielded up at least as much phosphorus as did five times as much rock phosphate. These are only isolated examples of the essential data which are being put into the hands of fertiliser and soil chemists and food producers by a logical use of the tracer principle. They represent only a beginning. The neutron irradiated fertilisers contained large proportions of radiocalcium, radiosodium and other radioactive elements. Ultimate conclusions may enforce important changes in chemical fertiliser formulation and uses. They may even bring appreciably nearer the goal, still so far from attainment, of cajoling the soil to yield an adequate sustenance to all who bring to it industry and a modicum of science.

Facts *versus* Prejudices

THE mental myopia in one connection of the brilliant Professor J. D. Bernal, which permitted him to tell a Moscow audience last summer that science "in capitalist countries" is directed by those whose only aim is to destroy and torture people for their own profit, has had the virtually unavoidable result. He has been dropped from the council of the British Association, whose devotion to the dispassionate presentation of facts cannot be reconciled with this eccentricity of the Professor of Physics of Birkbeck College. Characteristically, the British Association first invited the professor's own comments on the Moscow Press's version of what he said and took what comfort it could from his admission that scientists here and elsewhere are not, in fact, "haters of peace." That, however, conspicuously failed to substantiate the distorted picture of world science—outside the Soviet Union—which the professor is reported to have presented. He has the problematical advantage of saying the last word on the subject. By declining to re-elect him, states Professor Bernal in a letter to the association this week, "it is lending support . . . to a policy of using a scientific effort, far greater than is made available for improving the conditions of life of the people of this country, to produce new 'scientific' weapons clearly directed against the people of the Soviet Union."

THE SCOPE FOR SIMPLIFICATION

(continued from page 656)

in such cases the customer is usually willing to pay the higher price to cover the additional manufacturing costs.

Simplification, like any other good thing, can be carried to excess. Reduction of needless variety, and, in many instances a higher degree of specialisation, should broadly be feasible, however, without sacrificing individuality in production or unduly restricting the consumer's range of choice.

ATOMIC ENERGY EXHIBITION

Products of Sellafield Factory

"IF we can get an atomic reaction, we can release more than a million times more heat and power from a given quantity of material than is possible by the chemical reaction obtained from coal. It is because of that prospect that we must give very deep consideration to the possibilities of atomic energy," said Mr. C. Hinton, deputy controller of atomic energy production, at the opening, last Saturday, at Whitehaven, of the local atomic energy exhibition. (THE CHEMICAL AGE, *61*, 622.)

It was realised, he said, that the new factory at Sellafield (Cumberland) would be regarded with a good deal of suspicion. The exhibition was intended to show what lay behind the work that was being done there and to help the public to understand some of the problems involved.

Dealing with the question of personal danger, Mr. Hinton said:—

" It is true that we shall be discharging radioactive effluents and that they are potentially dangerous," but I find it difficult to think of any industry which does not discharge products in its effluents that are potentially dangerous. The reason they do not bother anyone is that these potentially dangerous products are so diluted, either before or after discharge, that they are completely innocuous. The same is true in our case. Radioactivity we discharge will be diluted in such a way that no danger can arise in the district."

Royal Society Honours

H.M. the King has approved the award by the Royal Society of Royal Medals to Sir George Thomson, F.R.S., and Professor R. A. Peters, M.C., F.R.S. These recognise the distinguished work of the former in atomic physics, notably in establishing the wave properties of the electron, and Prof. Peters' distinction in biochemistry, particularly in relation to vitamin B_1 and the mechanism of toxic action of Lewisite and arsenical compounds.

Among other honours just awarded by the Royal Society Council are the Copley Medal to Prof. G. C. de Hevesy, for his work on radioactive elements and the biological use of tracer technique, and the Davy Medal to Prof. A. R. Todd, F.R.S., for achievements in organic and biochemistry, especially in relation to vitamins B_1 and E.

NUCLEAR PHYSICS

Anticipating Industrial Application

PLANS are being pushed ahead to supply the deficiency of adequate discussion in Scotland of atomic energy. Glasgow, it is hoped, may ultimately become one of the important centres for discussion of atomic and nuclear physics, particularly with relation to their industrial applications. The development of experimental equipment at Glasgow University and the need to relate that research to industrial practice has encouraged the Glasgow branch of the Institute of Physics to launch a series of lectures this season, aimed at extending the distribution of current knowledge among physicists. Prof. Philip I. Dee, of Glasgow University, will launch this series with a lecture on "Waves and Atoms" and he and other speakers will maintain the course until late March 1950, when a survey " Recent Work and Future Prospects " will be made.

The hope is that this programme will awaken a wider interest in the subject and bring technicians in the West of Scotland up-to-date on the progress made in the field and lead finally to industrial benefits. Attendance will be limited to members of the Institute of Physics and their guests.

NOBEL PRIZE AWARDS

PROFESSOR W. F. Giauque, professor of chemistry at the University of California, has been awarded this year's Nobel Prize in chemistry. Aged 54, he has achieved wide distinction by his studies into the behaviour of matter in temperatures approaching absolute zero. In 1929, with another American scientist, he was co-discoverer of the oxygen isotopes.

The 1949 Nobel Prize in physics, worth approximately £11,000, goes for the first time to a Japanese scientist. Dr. Hideki Yakawa, aged 42, has been visiting professor of theoretical physics at Columbia University, New York, since September last, and receives the award for his theoretical research in the field of nuclear energy and fundamental contributions to atomic physics.

In 1935, when he was 28, the doctor announced in Osaka a new theory on sub-atomic particles, which was later substantiated in the identification of mesons.

The awards will be made at a ceremony in Stockholm on December 10.

Sulphuric Acid Statistics

U.K. Production and Consumption in Third Quarter

THE particulars of production and consumption of sulphuric acid and oleum in the third quarter of this year, issued by the National Sulphuric Acid Association, Ltd. (shown below), refer to the United Kingdom only and do not, as previously, include the quantities for Eire. An accurate comparison with other statistical periods is therefore not possible, although certain of the figures available give indication of an upward trend in use of acid as, even without the inclusion of Eire tonnage, they register an advance on the second quarter of the year. Examples are:—Stock of 100 per cent H_2SO_4 at September 30 (chamber and contact) 67,125 tons, against 62,421 tons (U.K and Eire) at June 30. Consumption: agricultural purposes 8695 tons of 100 per cent (1736 tons second quarter); clays (Fuller's earth, etc.) 2324 tons (2048 tons); paint and lithopone 28,595 tons (27,406 tons); rayon and transparent paper 46,385 tons (39,401 tons). Comparison of total acid production shows an apparent reduction of 24,303 tons.

CONSUMPTION OF SULPHURIC ACID AND OLEUM
United Kingdom

	Tons 100% H_2SO_4
Accumulators	2,287
Agricultural purposes...	8,695
Bichromate and chromic acid	2,790
Borax and boracic acid (" unclassified ")	
Bromine	3,189
Chlorsulphonic acid (" unclassified ")	
Clays (fuller's earth, etc.)	2,324
Copper pickling	551
Dealers	4,308
Drugs and fine chemicals	2,394
Dyestuffs and intermediates	15,738
Explosives	3,007
Export	728
Formic acid (" unclassified ")	
Glue, gelatin and size	220
Hydrochloric acid	15,133
Hydrofluoric acid (" unclassified ") ...	
Iron pickling (incl. tin plate)	21,677
Leather...	1,547
Metal extraction	532
Oil (mineral) refining	12,754
Oil (vegetable) refining	2,483
Oxalic, tartaric and citric acids (" unclassified ")	
Paint and lithopone	28,595
Paper, etc.	974
Phosphates (industrial)	1,439
Plastics, not otherwise classified	3,776
Rare earths (" unclassified ")	
Rayon and transparent paper	46,385
Sewage	2,990
Soap and glycerine	2,354
Sugar refining	152
Sulphate of alumina (" unclassified ")	
Sulphate of ammonia	59,837
Sulphate of barium	1,144
Sulphate of copper	3,647
Sulphate of magnesium	1,465
Sulphate of zinc	740
Superphosphates	101,929
Tar and benzole	4,155
Textile uses	5,823
Unclassified: Uses known	24,149
Uses unknown	9,939
Total	399,850

PRODUCTION OF SULPHURIC ACID AND OLEUM
(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock July 1, 1949 ...	31,933	28,835	60,768
Production	165,193	237,733	402,026
Receipts	38,421	14,205	52,626
Oleum Feed ...	—	2,936	2,936
Adjustments ...	–341	–134	–475
Use	91,588	82,044	173,632
Despatches ...	112,366	165,658	278,024
Stock Sept. 30, 1949	31,252	35,873	67,125
Total capacity represented	199,170	253,370	452,540
Percentage production	82.9%	93.8%	89.0%

RAW MATERIALS
Tons

	Pyrites	Spent Oxide	Sulphur and H_2S	Zinc Concentrates	Anhydrite
Stock, July 1, 1949	64,404	171,648	75,606	11,250	840
Receipts ...	55,999	52,086	80,553	70,840	43,390
Adjustments	+84	–213	–82	+16	—
Use	49,750	45,735	77,818	36,484	43,480
Despatches...	61	3,959	59	—	—
		49†	99†		
Stock Sept. 30, 1949	70,676	173,778	78,101	45,622	750

† Used at works for purposes other than sulphuric acid manufacture.

More Sulphuric Acid for Australia

Plans to increase the Australian production of sulphuric acid will result in important extensions to the works of Sulphide Corporation, at Cockle Creek, New South Wales. Two technicians from Great Britain recently visited Australia in relation to the project, Mr. Stanley Robson, director general of research, Imperial Smelting Corporation group and Mr. A. T. Rogers, chemical engineer of the same group.

GERMAN TECHNICAL DATA

Stimulus to U.S. Chemical Industry

THE full benefit which America may ultimately derive from the body of technical information gained from Germany since the war, is only just beginning to be realised.

More than 100,000 reports on synthetic fuels, jet missiles, chemical warfare agents and many other subjects have been released so far. It will probably take many years to evaluate all the millions of pages of technical material obtained from the Germans, Colonel Kuhn, president of the Armed Forces Chemical Association, told a recent meeting of the American Chemical Society.

The subject file of the Office of Technical Services, which handles the work for the U.S. Government, contains more than 450,000 cards, but the indexing is by no means complete.

One of the most significant developments, so far as the chemical industry as a whole was concerned, said Col. Kuhn, was the Fischer-Tropsch process for production of synthetic oil from coal. The first commercial plant is expected to go into production shortly at Brownville, Texas, where about 150 tons of oxygenated chemicals will be produced daily.

Special Hydrogen Peroxide

Information relating to the manufacture of high concentration of hydrogen peroxide and its safe handling, storing and shipping had stimulated its production by two firms in the U.S.A., the Colonel continued.

Two other German chemicals referred to by Colonel Kuhn, which are now in commercial production in the U.S.A., were the so-called white carbon black and chlorobromomethane. The former, originally developed as a substitute, is a finely-divided silica. The latter, a new fire-fighting fuel, was used by the Germans in fixed fire-extinguishing systems in naval vessels.

In the range of insecticides a number of German developments were being exploited in the U.S.A., including the fluor analogue of DDT which is claimed to be less toxic to warm-blooded animals and fish.

Carbomethyl cellulose, produced in Germany under the trade name Tylose, was stated to have the property of keeping dirt in suspension when used as an ingredient of washing powders.

SUPERPHOSPHATE TALKS

Experts Study Italian Methods

SOME 100 delegates from no fewer than 17 different countries in Europe, Africa, Asia, and Australia attended a series of technical meetings in Italy of the International Superphosphate Manufacturers' Association held between October 25 and 28.

The meetings were held in Milan and Assisi at the invitation of the Montecatini group, by whom all arrangements were made.

While in Milan, a number of papers under three main headings were presented and discussed. They dealt with sulphuric acid and phosphoric acid fertilisers, triple and ordinary superphosphate.

Delegates visited in Assisi the completely reconstructed superphosphate plant there which employs the Montecatini process for continuous production and, on the way from Milan, a visit was also paid to the sulphuric acid works at Reggio Emilia.

It is planned that the next series of technical meetings of the association shall take place in France in late September or early October 1951, by invitation of the French superphosphate producers.

Two Killed at I.C.I. Works

A FATAL explosion which blew off the top of a big liquid chemical tank occurred at the Lostock works of I.C.I. (Alkali), Ltd., Northwich, on November 1. The victim was Mr. Samuel Wall, aged 54, boiler-maker, of Northwich, who was carrying out repairs to the tank, which holds many thousands of gallons of chemicals, and was standing on the roof when the explosion occurred. He was blown a considerable distance. Two men working near the spot had narrow escapes.

Mr. Norman Evans, a labourer, of Chapel Lane, Moulton, near Northwich, was killed at his work at the Lostock Chemical Plant of I.C.I. (Alkali), Ltd., on November 5 when he was caught in a moving belt. Mr. Evans was 41 and was married.

Fatal Accidents Decline

DEATHS from industrial accidents reported in September were 108, compared with the revised figure of 132 for August 1949, and 129 in September last year. There were only two deaths in the chemicals, oils, soap and allied trades, a drop of seven below the number reported for the previous month.

SCOTTISH ENGINEERING

Future Aid to Chemical Engineers

IN a progress report on the establishment at East Kilbride, Scotland, of the new DSIR mechanical engineering research laboratory, it is stated that much of the work to be undertaken will demand equipment of a type not previously in use. Regarded as a most encouraging feature of the staff situation is the number of university men who have already indicated their interest in employment in this new laboratory. Among them, it is said, are several Scottish graduates who have been doing research work in England at a higher rate of pay than they are being offered at East Kilbride.

While the laboratory is not yet shaped to handle chemical engineering problems as such, it is expected that it will provide a great deal of new data for this type of research, leaving it to commercial undertakings to follow up the chemical aspects. In the general programme are such subjects for research as the flow of materials, heat transfer, and problems of lubrication and corrosion.

The East Kilbride laboratory is expected ultimately to employ some 600 technicians and scientists, and the probable annual expenditure is estimated at £250,000.

Another Steel Record

STEEL production in October attained a new high level, the output of ingots and castings reaching an annual rate of 15,959,000 tons, 53,000 tons more than in the previous month. The former record for October was established last year with a rate of 15,455,000 tons.

Pig iron also showed an increase in output, with a total last month of 9,565,000 tons, as against 9,525,000 tons in October last year.

Total steel production for the first 10 months of this year amounted to 12,814,000 tons, an increase of 561,000 tons, compared with the same period last year.

Comparative figures for October and the first three quarters of the years 1948 and 1949 were :—

STEEL INGOTS AND CASTINGS
(Thousands of tons)

	1949		1948	
	Weekly average	Annual rate	Weekly average	Annual rate
First quarter	305	15,850	287	14,933
Second quarter ..	307	15,944	295	15,325
Third quarter ..	280	14,552	269	13,998
October ...	307	15,959	297	15,455
PIG IRON				
First quarter ...	179	9,324	175	9,084
Second quarter . .	184	9,559	182	9,464
Third quarter ...	182	9,448	176	9,143
October	184	9,565	183	9,525

PARLIAMENTARY TOPICS

Report on Water Pollution

QUESTIONS regarding the prevention of pollution of Scottish rivers were dealt with by Mr. Arthur Woodburn, Secretary of State for Scotland, who stated that treatment of sewage and effluent was the concern of local authorities, but he would give them all support. Asked if it would not be advisable to create one pollution authority, so that there would be a uniform approach to the problem, Mr. Woodburn replied that recommendations of a practical nature might be expected from the report of a sub-committee of the Water Advisory Committee at present considering the problem of river pollution.

PURCHASES of rubber for stockpiling in the U.S.A. were the subject of a question by Mr L. D. Gammans to the Chancellor of the Exchequer. In reply, the Economic Secretary to the Treasury (Mr. Douglas Jay) said that the U.S. Government did not publish figures of quantities taken into the stockpile, but total exports from British territories in South East Asia from January 1 to August 31 this year were 164.908. The U.S.A. had recently announced that purchases were to be resumed.

ADMINISTRATIVE and technical posts vacant in the Colonial Service were shown by the Secretary of State for the Colonies (Mr. Creech Jones) to have been 1198 on September 30, compared with 1395 at the end of June. He said that a system of central pools of specialist officers, which could be drawn on by Colonial Governments to carry out particular undertakings, had already been adopted in various fields of research, notably medicine and agriculture, and might well be extended to other specialised services.

Castor and Rape Oils

THE Ministry of Food announces changes being made in the arrangements for the supply of crude and processed castor and rape oils. (1) For supplies (as from November 5) buyers of crude castor oil and rape oils should apply direct to the Hull or London branches of the National Association of United Kingdom Oil and Oilseeds Brokers, Ltd., which will issue contracts on behalf of the Ministry at the official prices ruling at the time.

(2) The Ministry will discontinue the issue of supply orders for processed castor and rape oils for delivery after November 5, and buyers should thereafter apply direct to processors for supplies.

WATER POLLUTION

DSIR Work on Trade Effluents

INVESTIGATIONS of waste waters from the washing of wheat and the steeping of barley, and of the treatment of effluents from the manufacture of cider and the pickling of steel, are among the work of the Water Pollution Research Laboratory, described in "Water Pollution Research, 1948," published for the DSIR by HMSO (1s. 3d., by post 1s. 5d.).

The most detailed work appears to have been on the treatment of waste waters from electro-plating and particularly of those containing cyanides. A procedure is described by which cyanide can be removed by treatment of the liquids with bleaching powder or sodium hypochlorite in alkaline solution under controlled conditions.

At the request of the Mersey Docks and Harbour Board an attempt was made to determine what would be the effect of discharging into the Mersey Estuary an alkaline sludge produced in the manufacture of sodium carbonate by the Solvay ammonia process. Untreated sludge had a specific accelerating effect on the rate of deposition of mud from the estuary water, but this effect could be removed by carbonation of the sludge.

Sludge and Waste Liquors

Although suggestions were made which would mitigate the effects of the discharge of sludge, it was impossible to forecast the ultimate effect of the material on the growth and consolidation of banks in an estuary, and the investigation has emphasised the urgent need for basic research into the factors affecting deposition and erosion in estuaries.

Some of the investigations which have been undertaken on purification and disposal of waste liquors are reported to have been of direct profit to industry in suggesting improvements in manufacturing processes or methods of reducing losses of valuable materials.

Of the new investigations referred to, one of the most interesting is that to be undertaken for the Port of London Authority, to examine the causes of silting in the Thames Estuary. The survey will include investigation of the degree of pollution of the estuary water, the character of the bottom deposits, the quantity, nature and origin of the material carried in suspension and the physical and chemical effects of polluting substances

NEW FREEZING PROCESS

Industrial Ice Blocks in Two Hours

A NEW technique in ice manufacture that shortens the freezing process from about 20 to two hours, with a substantial saving in investment and production costs, is reported in Haifa (Israel), developed by a local engineer and industrialist, Mr. Eugen Wilbushewich.

The new technique departs from the customary method by dispensing with the medium of brine, and the evaporating of ammonia abstracts the heat directly from the fresh water moulds. In the experimental plant, the square mould is placed inside a container in which ammonia is gasified. As the ammonia evaporates, it absorbs the heat of the fresh water through the walls of the galvanised steel mould and freezes it into a square 25-kilo block of ice of the exceptionally low temperature of −15° C.

An ice block of anything less than −4° C., by the old method, is prone to crack on contact with the warm water with which it has to be loosened from the mould. The new technique uses warm gas for defrosting, and the conic blocks slip out with a shrinkage of only 2 per cent.

The new way of manufacturing ice requires very much less than the electric power now consumed by ice factories. Costs of maintaining compressors and other machinery may be reduced and only one-sixth of the normal factory space will be needed.

Supersonic Factor in Electrolysis

DR. F. A. LEVI, of the University of Perugia, reports in *Ricerca Scientifica* some interesting experiments he has carried out with supersonic waves.

Concerning the formation of metal crystals in electrolysis Dr. Levi has studied especially the influence of supersonic acoustic waves. He constructed a special apparatus for his experiments, in which these waves were generated in water by piezoelectric quartz and introduced into the cell through a thin metal strip, the inner surface of which acted as a cathode. Thus the effect of supersonic waves operated during the formation of the crystals. The electrolyte used was nitrate of silver and the best results were achieved with the most concentrated solutions.

The experiments showed that with supersonic waves a much finer crystal structure is obtained.

ESTIMATION OF WATER IMPURITY

Recent Analytical Technique Discussed

THE various established methods of water examination and some recent improvements in analytical techniques were discussed at a recent meeting in London of the Society of Public Analysts and Other Analytical Chemists.

Dr. J. H. Hamence described the work of a joint committee representing the SPA, the Institution of Water Engineers, and the Royal Institute of Chemistry, which had been set up to formulate standard methods for the physical and chemical examination of water. Its report, just issued, also recommended the publication of the results of analysis, and expressed the hope that the suggested standard methods would form the basis of English official procedure. The work of the committee, he said, had demonstrated that considerable interest was being taken in the chemical examination of water, but that many related problems still remained to be solved.

Turbidity

In a paper on "The Determination of Turbidity," Dr. Roy C. Hoather reviewed the methods at present in use, the results of which, he said, were expressed in parts per million on the fuller's earth or silica scale, and the instruments used had to be calibrated accordingly. With a specified definition of the fineness of the suspension, the weight of fuller's earth afforded a fairly satisfactory means of standardisation.

To avoid slight variations and discrepancies as compared with the results given by the APHA instrument, it was suggested that, for the accurate preparation of the fuller's earth standard, the Jackson candle turbidimeter should be used in this country. This instrument—(which was shown at the meeting)—could also be used for directly determining turbidities greater than 25 parts per million. Its readings were almost independent of any colour in the water. Precise measurements could also be made with photoelectric instruments, but with these colour introduced a complication.

Dealing with residual chlorine determination, Mr. G. U. Houghton said a satisfactory method must be one of high sensitivity, tolerably free from interference by traces of other oxidants, and able to give sharp differentiation between free chlorine and chloramines. The original acid tolidine method of Ellms and Hauser was still in use but was not entirely satisfactory, and an improved *o*-tolidine had been prescribed officially in the U.S.A.

Useful modifications of the *o*-tolidine method were the so-called "flash" test and the tolidine-arsenite method. *p*-amino-dimethyl-aniline had been used with success for colorimetric determination and very promising results were being obtained by amperometric methods.

The methyl orange method, suggested Mr. Houghton, was worthy of further study. The Palin neutral-tolidine method made possible the separate determination of free chlorine, and mono-di- and tri-chloramines in a mixture. Iodimetric titration was valuable for higher chlorine contents.

A joint British committee had recently recommended that the Ellms and Hauser method be approved for use in this country for the time being and that the newer methods should be examined with a view to their future adoption as standard.

An improved method for the direct Nesslerisation of water samples was described by Mr. J. E. Houlihan. In this sodium hydroxide was replaced by sodium hexametaphosphate. Sodium hydroxide used in the preparation of samples could give rise to serious errors, as the Nessler colour deepened progressively with increasing concentration of alkali in the matching solution. Its use might be avoided by the addition of a small quantity of sodium hexametaphosphate (calgon), and filtration became unnecessary.

Value of Calgon

Calgon did not wholly remove the precipitate due to certain soluble salts present in some tidal river waters, but it could be used to reduce substantially the amount of sodium hydroxide that was necessary. The method had given results for sewages and effluents that compared favourably with those obtained by controlled distillation. It was simple and economical of time, bench space and apparatus. It should be applicable to a wide range of water samples.

New German Chemical Works

A superphosphate and sulphuric acid factory has recently started operations at Salzwedel.

CROTONIC ACID

Versatile Character of New Paint Material

CROTONIC acid is being produced in commercial quantities for use in the production of new protective films, moulding compositions, plasticisers, solvents, insecticides, vitamins and a wide range of organic compounds.

This unsaturated acid—CH_3 CH-CH-COOH—is a white crystalline substance with a melting point of 70-72°C. (158-162°F.) and a boiling point of 182-185°C. (360-365°F.). Crotone acid exists in two geometric forms, of which the trans-, melting at 72°C., is the more stable. Producers therefore attempt to manufacture the acid as the stable trans isomer, with only enough of the cis-form to give a slight depression of the melting point.

The *p*H of a saturated aqueous solution at 25°C. (8.5 gm. per 100 gm. water) is 2.5 and the ionisation constant $K-1.97 \times 10^{-5}$.

Crotonic acid is freely soluble in ethyl alcohol, iso-butyl alcohol and n-butyl alcohol, also acetate, iso-butyl acetate, n-butyl acetate and ethyl acetate. It is somewhat less soluble in toluene (37 gm. per 100 gm. solvent) and rather more so in styrene (42 gm. per 100). In vegetable oils, such as linseed, soya, castor and chinawood, crotonic acid is only slightly soluble.

Paint Uses

Crotonic acid is of interest to paint manufacturers for the following purposes:

1. As an ingredient of oil paints to improve gloss and increase covering power. This is described in U.S. patent: 833,274, November 24.
2. To form lacquer resins by condensation of the acid with linseed oil under the influence of heat and pressure. It is claimed in U.S. patent 2,188,882 that such resins exhibit fast drying action, good dispersion properties and excellent adhesion to metals.
3. To produce compounds suitable as protective coatings, *e.g.*, copolymers of crotonic acid and derivatives with vinyl esters. According to the French patent 837,360, taken out by I. G. Farbenindustrie A.G., and American patent 2,263,598, these copolymer films are characterised by their low water transmission factor, excellent ageing properties, high melting point, high gloss and excellent adhesion. American patent 2,346,858 describes a method of carrying out the copolymerisation in the presence of a drying oil.
4. To make varnish resins by polymerising a mixture of pentaerythritol, rosin acid and crotonic acid. This is covered by U.S. patent 2,383,624.
5. For making protective coatings from copolymers formed from crotonic acid and styrene or its analogues. These are described in British Patent 547,328; U.S. Patent 2,321,896; U.S. Patent 2,290,164, and U.S. Patent 2,260,005.
6. For producing film forming compounds by heating and blowing the crotonic esters of polyhydric alcohols to give resinous bodies. Three American patents mention these resins: 2,117,293; 2,156,141 and 2,198,373.
7. As plasticisers for cellulose lacquers the copolymers of crotonic acid and styrene are of practical interest. Glyceryl tricrotonate has been patented (French patent 766,698) as a plasticising compound for cellulose esters, particularly cellulose acetate, where films are required to possess great strength and flexibility at low temperatures. The ester of β-(2-methoxyphenoxy) ethanol and its homologues is claimed by U.S. patent 2,350,325 to possess excellent plasticising characteristics. The liquid is clear, colourless and non-volatile.
8. For wood sealing, the condensation product formed by fusing crotonic acid with isobutylamine is claimed to be very efficient (U.S. patent 2,233,531).
9. As chemical and solvent resistant coatings for chemical plant. These coating resins are made by copolymerising vinylidene chloride with a crotonate, such as allyl or chlorallyl crotonate.

Owing to the highly reactive nature of crotonic acid (due to the presence of the activated double bond) a very large number of resinous compounds can be formed. Many of these have already been studied by Tennessee Eastman Corporation and other chemical companies interested in developing crotonic acid.

X-ray Generator for Hospital

The U.S. Atomic Energy Commission has approved the export of a 2-million volt electrostatic X-ray generator for use by the Westminster Hospital, London, in the treatment of cancer.

DUTCH INDUSTRIAL TECHNOLOGY

Important Contributions by Chemists at Eindhoven

by J. GREENROYD

THE essential nature of the rôle played by the chemist in continually widening fields of industrial research is no longer open to doubt. To-day, in addition to his familiar function associated with the testing of materials, the chemist, and especially the physical chemist, is finding increasingly rewarding employment in the provision of new ones and, in doing so, occasionally lays the foundations of entirely new industrial activities.

Typical of the greater use of chemical methods is the research carried on at the Philips' Laboratory of Scientific Research, at Eindhoven, Holland. This centre, owned by N.V. Philips' Gloeilampenfabrieken, clearly evidences the changes that have taken place in the last ten years or so, an indication of which is the fact that this was previously styled Philips' Physical Laboratory.

Electro-Technical Problems

Although the laboratory had originally been set up for physical research, engineers were soon needed to cope with the development of radio sets, X-ray units, etc., which involved electro-technical and constructional problems. Chemists were then in a minority, but a change was necessitated to keep astride of manufacturing progress and there are at present about equal numbers of physicists, chemists and engineers.

At the central laboratory there are now about 750 employees—graduates, assistants, instrument-makers and other technicians, draughtsmen, administrative personnel, etc. The number of university science graduates there is about 150. The various manufacturing departments at Eindhoven and elsewhere have, in addition, their own development laboratories, employing some 2000 people, of whom about 150 are either university graduates or qualified engineers.

The increase in the number of chemists in the last few years is related principally to the programme for improving the quality of the articles manufactured, and the consequent search for other and better materials. Thus, new fluorescent substances and magnetic materials have been found which have contributed largely to the further development of tubular-fluorescent lamps, radio circuits, telephone parts, etc.

Injecting fluorescent powder into tubular electric lamps

In the manufacture of gas discharge lamps, first the sodium lamp, then the mercury vapour lamp, especially the super high-pressure mercury lamp, superseded in many fields the "tungsten" filament. Then, in the tubular-fluorescent lamps, it was the job of the chemists to find the special composition required for the white fluorescent powder which coats the inside of the tube.

The development of small radio valves and electronic tubes has led to the production of new apparatus and parts, particularly in the field of magnetic ceramics for filter coils. It has been very difficult to obtain for high frequency currents a coil of high quality and low losses, especially in small sizes. This has been countered by the use of cores made of iron powder, ferro-magnetic oxides, etc. These are virtually insulators and do not support eddy currents. By making various compounds, it has also been possible to reduce the rather high hysteresis losses which at first occurred.

Such has been the development of production of new ceramic materials for electro-technical purposes, to allow for simpler and better construction of parts, including condensers and resistances, that an entirely new building is being erected for their manufacture.

For long industrialists were faced with an apparently insoluble problem in relation to magnets. To achieve a sufficiently high ratio of magnetic attraction, so large a proportion of metal had to be used that the principle was often impracticable. One of the solutions to this came in Ticonal, a magnetised alloy developed by Philips. The Ticonal magnet can lift 3500 times its own weight, and two small magnets weighing only two pounds when placed together could not be dragged apart by two horses pulling in opposite directions.

As in other laboratories, the research work done in Philips' research establishment often produces results in a field entirely different from that intended. For example, an investigation that was begun to determine the efficiency of ultra-violet lamps for combating rachitis (rickets) led to a new method of producing vitamin D_3.

Synthetic Vitamins

The significance of this synthetic production of vitamin D_3, discovered by Dr. J. van de Viet and Dr. W. Stevens, both working for the chemical laboratory of the affiliated company of Philips-Van Houten, at Weesp, North Holland, lies in the prevention of bone weakness in chickens. Up to that time vitamin D_3 had been imported in the form of cod liver oil or prepared from Zeeland mussels, and was very much more expensive than the new synthetic material.

Incidentally, a merger has recently been reported between Philips-Van Houten, Roxane and Physica, the new company to be known as N.V. Philips-Roxane Pharmaceutical Chemical Industry "Duphar." The new organisation will concentrate on the research work, manufacture and marketing of its own products.

In quite a different field, investigations have been made by the Philips' Research Laboratories on behalf of a famous Dutch bulb-growing firm. In these experiments X-rays have penetrated the cells which form the bulb, regrouping the chromosomes. Actual changes have been made in the shape, colour and size of tulip bulbs and new and improved blooms have often resulted.

Micro-photography has recently been employed by Philips' chemists in developing and perfecting a grainless sensitive layer which enables extremely small reproductions to be made. Thus a single page of, say, the *Encyclopædia Britannica* can be reproduced in an area of one sq. millimetre.

High Frequency Currents

Since the end of the war, the Philips organisation has been working intensively on new applications of high frequency currents and inductive and dielectrical heating. This has opened up very wide possibilities for the application of local heat in industry for the melting, hardening and soldering of metals, for the bending and glueing of wood, the dehydration of pharmaceutical products, and the preheating of material used in the moulding of plastics.

The possibilities of plastic materials for use in Philips' workshops are continually being examined, and several of these have already been made synthetically. Special attention has also been given to researches in the field of solids and semi-solids.

Dr. E. J .W. Verwey, director of chemical research at Philips. and Prof. J. T. G. Oberbeek, of Utrecht, have concentrated much research into the mechanism of colloids, the stability of colloid solutions and the interaction of neutral colloidal particles, and Prof. H. B. G. Casimir, director of the Philips' laboratory, and his assistants have worked out their theories in detail.

One of the outstanding examples of the combination of physical and chemical research in the Philips' laboratory has been

(continued at foot of next page)

Philips' scientific research laboratory at Eindhoven, Holland

Increasing Production of French Chemicals

Handicap of Winter Power Shortages

PRODUCTION of French chemicals in the Lyons district continues above the 1938 rate. The manufacture of electrochemical products has been hampered during the past two winters by power shortages and this situation is likely to occur again in the coming winter. Production of chlorine, caustic soda and calcium carbide is particularly affected.

A more regular supply of ammonia and nitric acid is expected to be available from equipment now being installed in the Saint-Etienne region.

The present French production and export of caustic soda are more important than before the war, as shown by the following figures :—

	Production	*Export*
	metric	*tons*
1938	126,096	29,202
1946	104,708	14,329
1947	178,308	51,058
1948	196,000	53,097

In ten years, production has increased by 55 per cent. The 1949 figures so far available—approximately 17,000 metric tons a month—show further improvement.

Monthly production of soda ash in France in the first half of 1949 was below the average in the last quarter of 1948 which was 62,876 metric tons, states the Ministry of Industry and Commerce. In the first quarter of 1949, output averaged 58,964 metric tons monthly. Production in April and May was 50,376 metric tons and 14,801 metric tons respectively; the preliminary figure for June is 41,730 tons.

The monthly average rate of copper sulphate production in France in the first quarter of 1949 was almost double that in the last quarter of the previous year and also exceeded that in the similar period of 1938, according to the Central Bureau of Industrial Statistics. Monthly averages were 8133, 4263 and 6750 metric tons respectively.

A scheme inaugurated in 1947 to increase output of phosphate rock in French Morocco is expected to raise the annual production to 4 million metric tons by 1952. Totals for 1948 reached 3,226,325 metric tons, an increase of 526,325 metric tons over the previous year.

The recent export of 1930 metric tons of fluorspar, valued at $27,800, to the United States from Marseilles marked the first shipments of the mineral since before the war. Fluorspar was formerly a fairly regular export from the Marseilles district and the U.S. imports from France averaged 6000 short tons annually from 1920 to 1939.

DUTCH INDUSTRIAL TECHNOLOGY

(*continued from previous page*)

the simplifying of the manufacture of the correction plate invented by B. Schmidt so as to allow its production on a large scale. The Schmidt correction plate can now be used in cameras for photographing X-ray images produced on a fluorescent screen. It is now also possible to project enlargements of television pictures at no great additional cost.

The immense progress made in the manufacture of plastics has induced opticians and optical instrument makers to ask whether correction plates could not be made out of pressed material, and, indeed, polystyrene has been used for this purpose in the U.S.A. But this, involved rather a laborious process to produce a finished article of " optical qualities," and in the Philips' laboratories an entirely new method was worked out based on the shrinkage of gelatin solution when cooled.

The surprising thing is that shrinkage occurs so uniformly and so accurately that a very smooth surface is obtained with every detail of the mould reduced five times, but otherwise unchanged.

Thus the mould can be five times less accurate than the corresponding plastic moulds because any errors are reduced to one-fifth. Fine scratches in the mould, for instance, are no longer any objection as they will become five times as thin during the drying process of the gelatin, and their depth will, in many cases, be less than the wavelength of the light. They will remain practically invisible.

A second advantage is that moderate heating and cooling of the mould will suffice. Moreover, as no pressing is required, no distortion will occur. Thirdly, there is no deformation or mechanical bending of the plate, as the correction plate consists very largely of glass. The hard gelatin layer is more resistant to scratches, so that there is no objection to cleaning the plate with a soft cloth. The same mould can be used for correction plates with different " optical strengths."

TEMPERATURE AND HUMIDITY CONTROL

*Uses and Problems of Some Automatic Regulators**

By LEO WALTER, A.M.I.Mech.E., M.Inst.F., etc.

THE application of automatic temperature controllers to process work is prone to bring to light some apparently paradoxical factors.

A process may be simple in appearance and straightforward, as far as production is concerned, yet it may represent a difficult control problem. Some very complicated manufacture heating processes, on the other hand, permit quite simple means of setting up efficient automatic temperature control.

The fact that control by hand has produced quite good results, depending on the attention of a very skilled operator, who anticipates changes of temperature and acts accordingly, does not guarantee that the problem will not be a tricky one for automatic control.

It is disputable whether automatic control gear can often represent the perfect substitute for an efficient operator; even very elaborate temperature controllers, taking into account the amount and speed of temperature change for their counteraction and sometimes even the acceleration of changes, cannot have the quality of the human brain. They cannot remember or anticipate.

Merits and Limitations

During the last 20 years, there have been developed very efficient regulators with stabilising devices and mechanisms, which come as near to the perfect solution of the control problem as possible with mechanical means. Some are more reliable than the best operator. There are, however, instances where the human operator cannot be replaced, or where combined manual and automatic control is used.

A good operator can, of course, successfully improve bad heat balance by closing down heat input in an oversized heating surface long before any change of temperature has been visible, simply judging by experience. To blame the controller because it is incapable of doing just this is irrational and, taking into account the unreliability of the "human element" in general and the cost of an operator, the user should try to correct the plant characteristics and avail himself of the very many advantages of automatic control. Reduction of size of heating surface might make the plant much more controllable, and might allow the use of standard controller types.

A practical instance helps to indicate some of the familiar factors.

A chemical factory used a very large vessel with heating coils and asked for recommendations to replace hand control. The process went on for several days, once the vessel had been filled, and it was necessary to employ three shifts of operators to watch the temperature and to make the necessary adjustments to the steam valves to coils.

Too Exacting

The plant engineer had discouraging experiences, in view of the cost of the charge and the nature of the process. The firm stipulated so small an allowable tolerance for holding temperature, that the makers of controllers refused to make any recommendations at all.

After a short time (another charge having been spoiled during the night shift) further investigations revealed that the works chemist had stipulated a closeness of control which was never achieved with hand control and which the process, in fact, did not permit. Automatic temperature control did later preserve a reasonable maximum temperature, with some unavoidable fluctuations, and made the process independent of the operator's attention, as far as holding of temperature was concerned.

Briefly, closeness of control is a combined function of process and controller characteristics, and where the former are unfavourable, the user cannot ask for more accuracy than the process will allow. It is nearly always the process which governs controllability in the first instance, not the instrument.

Control and Fuel Economy

The practical application of thermostatic control by self-actuated or power-operated automatic temperature regulators is not the beginning but rather the end of measures for improving heat and fuel economy of industrial plant equipment. Recent years have produced great progress towards this end and fuel consumption per produced unit of production or per square foot of heated factory space has diminished almost everywhere. Thermostatic controllers have played their full part in procuring these economies.

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* Previous parts of this series appeared in our issues September 17 (389-393) and October 15 (528-532)

Research work and a great amount of practical investigation on heat and fuel economy in industrial works have laid the foundations for enormous possibilities of saving of fuel, but the continuing discrepancy between actual and desirable figures of fuel consumption in various branches of industry demands more detailed investigation of how heat—and especially steam and hot water—are used in practice.

These investigations are still going on, but there can be little doubt that the wider use of automatic control instruments in general, and of reliable temperature regulators for providing thermostatic control to process plant equipment and factory heating in particular will be recommended.

Common Objections

Once improvements by a competent authority have been recommended for heat—and fuel—economy, they should be carried out. The reasons for delays can be financial, or they can be reluctance to alter old-established and probably wasteful manufacturing methods or working conditions.

Instances have come to the writer's notice of workpeople who were reluctant to fit a straightforward temperature regulator, which would quickly have paid its way in steam savings, because they regarded any industrial instrument as "a box of tricks." In other cases it has been pointed out that the plant is so old-fashioned and nearly obsolete that it is ripe for the scrap heap; but replacement at an early date is not today a certainty. What such deferment may mean in relation to industrial furnaces in terms of wasted fuel can only be guessed. Fitting automatic controllers to obsolete plant equipment is, however, usually a very difficult task, because low plant efficiency and control accuracy usually go hand in hand.

It is heartening, however, that most of the new factories, in being or being built, in this country are second to none so far as production equipment is concerned, and provide the utmost fuel—and heat—economy. Nearly all heat flow processes are automatically controlled and preventive maintenance of plant and of instrumentation is at a very high level of efficiency. The contrast which they afford with some of the older existing plants is extreme.

Reports from specialist engineers, who visit industrial establishments all over the country, are revealing documents. Investigating possibilities of thermostatic control of factory space heating reveals how commonly overheating of factory sheds takes place during mild weather or warm spells during the day, regardless of the axiom that overheating of 1° F. of room temperature can theoretically waste up to 5 per cent of fuel (Fig. 11).

Bearing in mind that heat losses from a building (which must be replaced by controlled heat input) are approximately proportional to the temperature differential between inside and outside temperature, it is obvious that even the best heating system is too powerful during mild

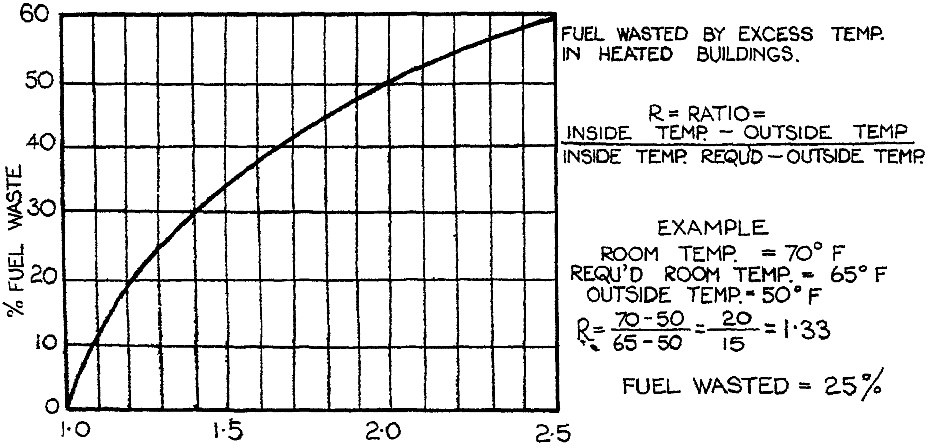


Fig. 11

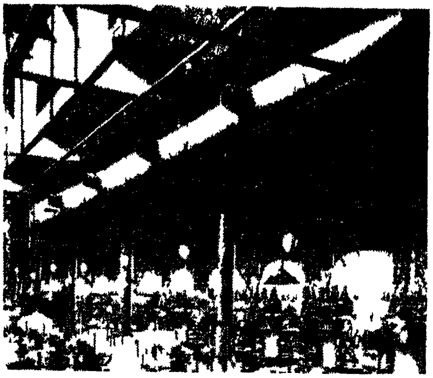
weather, unless it is controlled by room temperature regulators or centrally controlled by varying automatically steam-pressure or hot water flow temperature in the boiler house.

The use of room thermostats, which can be electrically or pneumatically operated or self-actuated, has increased since the war, but we are very far from the ideal state of every radiator, heating pipe range, unit heater or central air heater battery having its automatic temperature regulator. Automatic control of factory space heating, using the right mode of control and the right types of controllers, is a paying proposition, apart from the necessity to save fuel in the national interest. The number of obsolete factory heating systems, unfortunately, is still large, and it is doubtful if automatic control should be applied where a better heating system is the essential.

Fig. 12 illustrates a modern factory air conditioning system, where conditioned air is blown into the factory space at controlled temperature and humidity.

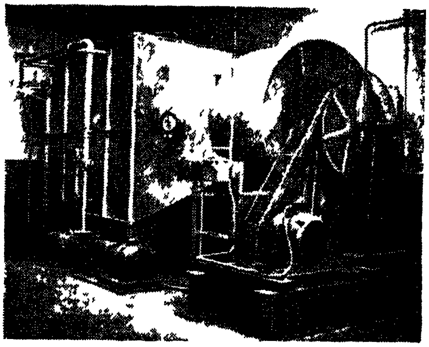
Air Conditioning

The much wider use of air-conditioning plants with automatically controlled air temperature, humidity and distribution, not only as part of the manufacturing process (spinning rooms, etc.) but purely for heating and ventilating purposes would be a heat and fuel saving measure of first magnitude. Fig. 13 illustrates a central air conditioning plant, consisting of fan, air washer chamber, distribution duct and automatic controllers for air temperature and humidity, which can be placed in a small annexe and would improve working conditions and effect fuel savings. Wherever heating and ventilating is inadequate or wasteful, the smaller air conditioning units, as ceiling or wall fittings, could procure the same effect in limited areas. They are equipped with temperature and humidity control instruments just as are the big central plants. They are largely exported to tropical and cold countries, but their use in home factories is also steadily increasing.



[Courtesy of Mellor Bromley & Co Ltd

Fig. 12



[Courtesy of Hall & Kay Ltd

Fig. 13

Another measure for improved economical heating systems is radiant heating. The use of wall or ceiling panels has been common for many years, but the use of wrought iron heating elements embedded in the floor of newly erected factory buildings is securing wide adoption in the U.S.A.

The other system, of pipes buried under the floor, which heat the whole building by radiation, permits control of the heating medium (either warm water or steam) to be performed centrally by inside-outside control of flow pressure, or flow temperature. It is claimed that considerable fuel and heat savings are obtainable from large radiant heating factory installations, but the available data in this country, under different climatic and structural conditions, do not allow a firm conclusion to be reached.

Thermostatic control of any well-designed and efficiently run factory heating system, whether using radiators, heating pipes, unit heaters, plenum heating batteries or air conditioning plants, is not "desirable auxiliary equipment" of a factory heating system, but a necessity.

There are many equivalent untapped sources of fuel economy, which, although known, are not being explored. How many central heating boilers, using coke or other fuels, are fitted with an efficient boiler combustion control system? This question does not take account of the ordinary bellows-thermostats, acting or the ashpit door, and giving only a very approximate draught control.

There are to-day many more effective methods, such as the electrical control gear, which provides a more efficient combustion control method. In this a flow thermostat actuates a motorised unit, which in turn automatically adjusts the ashpit damper and flue check damper. Replacement of uncontrolled, or badly controlled central-heating boilers in this country, assuming that each is responsible for a fuel loss of between 5 and 10 per cent, due to inefficient boiler control, might substantially alter the fuel supply position.

Another source of heat waste is the central heating systems of blocks of flats and large public buildings, which operate without inside-outside control. "Weather control" is, of course, also applicable to factory heating systems, using steam or accelerated hot water, and consists of an outdoor thermostat, which automatically readjusts a thermostatic blender, or a motorised gradual mixing valve, which mixes return water with flow water in the case of accelerated hot water heating. The outdoor thermostat instantly responds to any change of temperature, readjusts flow temperature without the usual prolonged time lag. Yet another control system, applicable to steam boilers for heating purposes, produces variation of boiler draught and combustion in accordance with the signals from an outdoor thermostat. It works electrically.

Process Control

The number of thermal industrial processes which lend themselves to thermostatic control is practically unlimited. Wherever heat flows into a manufacturing process, a definite amount of heat flow is required at any moment during processing. Automatic temperature regulation takes care of the fact that heat demand varies, and heat supply has to be adjusted accordingly.

Control of temperature of boiling liquids in open vessels is not generally feasible; the boiling temperature will always be in the region of 212° F., so that no real control impulses are obtainable from an immersion thermostat bulb. It is, however, exceedingly difficult for a plant operator to set a hand control steam valve exactly at the point where steam is not wasted by bubbling through the liquor uncondensed without giving up its heat.

It is, however, often possible to apply thermostatic control to temperatures just below the actual boiling point, which produces gentle boiling, or "submerged boiling." By setting the thermostat at, say, 211° F., a near boiling condition of the liquor can be kept under control and steam and fuel are saved.

A great source of waste of heat is the use of steam for agitation, in addition to boiling, a principle that should be replaced by mechanical stirrers, compressed air or a circulation pump.

Hot Air Drying

Investigations of existing hot air dryers tend to show that many pieces of apparatus could be run much more efficiently. It is advisable to determine, before fitting thermostatic control, what is the efficiency of the dryer concerned.

Figures for steam consumption differ very widely for similar apparatus in different works, operating under more or less efficient working conditions. For example, these actual figures relate to textile dryers: A carboniser consumes from 2.6 to 0.56 lb. of steam per lb. of treated wool; a tunnel dryer from 2.9 to 1.2 lb.; a loose wool dryer consumes 2.7 lb. of steam under bad working conditions, but by introduction of recirculation of air and thermostatic control steam consumption per lb. of dried wool could be reduced to about 1.25 lb. of steam per lb. of dried wool.

Means of improving dryer efficiency are: Recirculation of exhaust air, which might produce heat savings up to 28 per cent; improvement of steam trapping and air venting; better distribution of warm air within the dryer; and, not least, application of automatic temperature and humidity control.

Control of Industrial Furnaces

One of the more interesting means of improving thermal efficiency of heat treatment and other types of furnaces is the highly sensitive electronic control system. In a pusher type continuous furnace, having two zones, automatic control is confined to the final zone and an optical pyrometer-controller with electronic amplifier regulates fuel supply via an electronic relay. The relay magnifies the minute impulses resulting from temperature changes for continuously readjusting a motorised gradual control valve in the fuel supply pipeline. An electric potentiometer-controller is used, with an indicating scale. In addition, furnace pressure is also regulated by an indicator-controller, and temperature in a selected zone is measured from a unit fitted in the furnace roof. Furnaces having three or more zones should have at least two zones automatically controlled.

(To be continued)

SCARCE MINERALS IN N. TRANSVAAL

Increased Demand is Stimulating Production

A COMPREHENSIVE review of mining activity in Northern Transvaal was recently presented to the Pietersburg Chamber of Commerce and Mines by Mr. G. F. Fourie, mining commissioner for the district. His report, which is for the year ended July 31, 1949, is published in *The South African Mining and Engineering Journal,* and emphasises the sustained interest in the Pietersburg area and its growing importance in base mineral production.

The Pietersburg mining district covers an area of almost 40,000 sq. miles, comprising Northern Transvaal. Nearly every known mineral occurs there and, of some 40 varieties discovered, 18 have been exploited. Gold, antimony, asbestos, copper, corundum, felspar, mica, salt, silica, tin, and vermiculite are probably the most important of these.

Intensive prospecting by means of boreholes on the copper belt along the Murchison Range by a Johannesburg mining group has yielded significant results. Some of the boreholes disclosed that, in addition to copper, payable deposits of zinc were also present. If the zinc lode should be found to be an extensive body, it was likely that the first zinc mine in the Union would be located in the Northern Transvaal. Mr. Fourie looked forward to the opening of the Murchison Copper and Zinc Mine in the very near future.

Only the Messina (Transvaal) Development Co. was producing copper in Northern Transvaal, but Northern Transvaal (Messina) Copper Co., had made good progress in developing its property. Prospecting had disclosed that copper existed in payable quantities, and exploitation had started.

Copper Occurrencies

Large areas which were considered to contain this mineral had recently been pegged in the Leydsdorp area. In addition to prospecting by means of boreholes along the Murchison Range, prospecting on other known lodes south of Messina and in the Matamba area was being continued. Copper occurrences along the Pafuri river, some 100 miles north-east of Louis Trichardt, were being investigated by a large American concern.

Pegging of new ground continued, and licences for some 62,613 base metal claims were issued. The total number of claims held at July 31 was 112,715. Thousands of additional claims on the asbestos fields had been pegged and prospectors were still applying for licences. Some 75,000 claims were operative on these fields. In addition, many private farms had been taken up for asbestos mining.

During the last seven months over 9000 tons of asbestos fibre had been produced, and either shipped overseas or supplied to factories in the Union.

One of the urgent needs of the moment was for machinery for road work on asbestos properties.

Insufficient Tin

The production of tin was still below the Union's requirements. Only two mines were producing tin in the Pietersburg district, one having recently closed down. Prospecting parties for the Department of Mines were continuing investigations with encouraging results.

The Zaaiplaats Tin Mining Co. was still the only concern undertaking the smelting operation, and it had during the past year produced approximately 600 tons of metallic tin.

Vermiculite, although in very great demand, had diminished in output by some 4000 tons. Bad roads, reconditioning of plants, shortage of bags and reorganisation of the industry were the chief reasons. Plant extensions were being carried out by the three companies operating at Palabora and output should be increased early in 1950.

Recovery of gold had increased from 5000 oz. in 1947/48 to 11,000 oz. in the past year. Mining in the past had only been superficial, and nowhere had it been conducted at depths lower than 300 feet. There was a possibility of rich deposits being disclosed.

The demand from the U.S.A. for corundum remained firm but the African price must be kept low enough to combat competition of the artificial material.

In conclusion, Mr. Fourie stressed the great need in Northern Transvaal of an efficient water and electric power supply. A water supply dependent on boreholes did not encourage the establishment of new industries, nor was the system of small power units all over Northern Transvaal a satisfactory one.

Soviet Direction of German Industrial Chemistry

Complete Domination of Production

THE overruling authority for all industry in the Soviet zone of Germany is the SMA (Soviet Military Administration), and the chemical industries, like all others, are completely dominated down to the smallest detail of productive organisation by Russian economic principles. A writer in *Chemische Industrie*, October 1949, points out that the two-year plan for 1949-50 shows that production in the Soviet zone is directed entirely in accordance with the needs of the Soviet Union.

Expropriation and Dismantling

At least 80 per cent of the chemical industry has been expropriated. It is true that there is a so-called German organisation, the DWK (Deutsche Wirtschaftskomission or German Economic Commission) with its secretariat, which appears to be endowed with a certain amount of power and independence. That, however, is more apparent than real, despite the fact that it can issue decrees and regulations through its official organ *Zentralverordnungsblatt* published in Berlin.

The chemical industries have experienced a heavy toll of dismantling, so that more than 80 per cent of the soda industry and 60 per cent of the previous capacity of the sulphuric acid and nitrogen plants have been affected. Sulphuric acid is about the only important chemical that was not, before the war, manufactured in relatively large quantities in what is now the Soviet zone, and represented no more than 20 per cent of total German output. Now the output is only approximately one-third of the pre-war quantities, and does not meet the meagre demands of its own home market; and that demand is, of course, much reduced, for one thing by the almost complete cessation of superphosphate manufacture.

Diminished Supplies

This lack of acid and other basic chemicals, including calcium carbide (and acetylene), caustic soda, etc., has naturally had far-reaching effects on industries such as the manufacture of plastics, synthetic fibres, and others.

There is now little of private enterprise left. Most of the leading firms have disappeared and been replaced by Soviet A.G.s or other form of Soviet undertaking. Examples (with present capital in 1 million roubles), of original German firms, are: Leuna-Werke, fertilisers, 400; Agfa-Wolfen, photographic films, 200; I. G. Farbenindustrie, Bitterfeld, alkalis, 210, potash production, 320; I. G. Farbenindustrie Schkopau, with others, rubber, 520. These statements of capital relate to the period before Soviet currency changes.

There appear to be two different categories of undertakings under Soviet regime, namely: (a) the so-called Soviet A.G.s or S.A.G., and (b) the Volseigene or Co-operative trusts. Under the former there are some 162 factories, employing 32,000 workers, with output for 1948 valued at RM.300 million. The number of factories controlled by these trusts in the different branches of chemical industry are: Inorganic (acids, alkalis, salts), 17; organic (solvents, dyes, glycerine, explosives, etc.) 7; potash, pyrites, fluorspar, 17; hydrocarbons (paraffins, waxes, candles, etc.), 17; industrial gases and carbide, 15; plastics and allied materials, 10; paints, varnishes, etc., 28; soaps, detergents, cosmetics, 14; drugs and medicines, 11; miscellaneous chemical-technical products, 26.

Distribution of Industries

Percentage distribution of (a) industry generally, and (b) chemical industry under the different categories or forms of undertaking, for 1949, is as follows:—

	(*a*)	(*b*)
Co-operative trusts	42%	20%
Semi-state	8%	—
Soviet A.G.	25%	60%
Private enterprise	25%	20%

The position in regard to inter-zonal chemical trade, *e.g.*, with Western Germany, and to export trade, is not very clearly defined. As to inter-zonal trade, certain essential basic materials are apparently being obtained from the West. A so-called German Trading Co. (Deutsche Handelsges., Berlin m.b.H.) was established in 1948, to centralise trading in merchandise generally. It rapidly grew into a huge bureaucratic concern, employing 10,000 persons, but seems later to have been decentralised into several local offices. Although private enterprise is not yet wholly crushed, what little is left carries on under increasing difficulties and restraints.

CHEMICAL EXPANSION IN THE U.S.S.R.

Five-Year Plan to Develop Rich Resources

RUSSIA has enormous natural resources, and practically all the raw materials required to establish chemical industries on a large scale are, for the most part, plentifully available. The one possible exception is rubber, but here progress is being made in the synthetics field and also in the use of certain native plants capable of yielding natural rubber.

The removal to the East, during the war, of a large proportion of the chemical and other industries brought a substantial degree of industrialisation to the Ural districts, Siberia, and Central Asia; at the same time a great deal of reconstruction has been achieved in the West and in the Ukraine.

Eastern Russia gained other advantages from the Soviet policy, after the war, of exacting compensation by importing German plant and machinery and numbers of German scientists and engineers. Much of this material, both human and mechanical, was sent to the east. That helps to explain how in certain parts of Siberia and Central Asia, the greatest developments of chemical industry have taken place.

Special attention has been given to the chemical industries in the five-year plan for 1946-1950, and it has been stated by the Director of the State Planning Commission, N. A. Vosnessenski, that output of chemicals and allied products by 1950 would be 1½ times that of pre-war.

Some of the estimates given for that year are: caustic soda 390,000 tons, soda ash 800,000 tons, mineral fertilisers (superphosphate, nitrate, potash) 5.1 million tons, synthetic fertilisers 43,000 tons, coal 250 million tons, petroleum 35.4 million tons, natural gas 1.9 milliard cu. m.

Production Plans

Phosphate production is being doubled, and new superphosphate factories are being erected in Central Asia to exploit deposits of natural phosphate at Kara-Tau. New branches of organic synthesis are being developed in order to manufacture by products of coal distillation and oil refining. Three soda factories are being rebuilt: and other factories include two for aniline dyes: two for paints and varnishes; and three for plastics, of which new types are being developed.

According to the Soviet statement, the output of synthetic rubber is to be doubled by 1950, that of automobile and tractor tyres tripled, and of rubber shoes increased by one-third above pre-war figures. It is estimated that the annual output of regenerated rubber will be 56,000 tons in 1950, and that of natural rubber from various native plants is to be organised on a much broader basis.

Fuels

Coal for coking is reported to be available to provide about 53 million tons p.a. Large advances are claimed to have been made in underground coal gasification, so that by the end of the five-year period, it is intended to produce 920 million cu. m. of gas. Liquid fuels from coal and shales should amount to 900,000 tons.

Peat is another of the fields in which research is said to have been prosecuted vigorously. Petroleum production and refining, especially in the east, has been largely increased. Both in quantity and quality, fuel oils for aircraft, tractors and automobiles and lubricating oils of all kinds are to be largely stepped up. Petroleum chemicals are also being developed. For the next five-year plan (1951-6) several new oil refineries are contemplated.

Commenting on these and other data in the most recent Soviet report, Prof. Dr. Peter-Heinz Seraphim, in *Chem. Industrie* (October) says that, despite the wealth of data provided, it is difficult to get a true picture of actual progress.

One important factor in making comparisons between pre-war and post-war achievement is the considerable extension of Russian territory. This may often account to a large extent for the increased production or increased capacity claimed. The new territories have certainly added substantially to timber, mineral oil, phosphate and other materials.

There is little doubt, however, that, compared with 1938, chemical output increased in 1948. The number of workers engaged is about 280,000 or 4.3 per cent of the industrial total, and the value of output represents 4.2 per cent of the gross total. Some figures for 1948 (1000 tons), with 1938 in brackets, are: sulphuric acid 1900 (1600), soda ash 610 (532), caustic soda 125 (88), aniline dyes 56 (35), rubber 79 (53), plastic materials 24 (14), asbestos 90 (86), apatite 1700 (1571).

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

THE Aluminum Ore Company, a wholly-owned subsidiary of the Aluminum Company of America, has completed construction at East St. Louis, Illinois, of a new plant to produce fluoride chemicals at a rate of 10 million lb. per year on one-shift operation. The principal products of the new plant, which represents an investment of about $1 million, are sodium fluoride, sodium bifluoride and high-strength hydrofluoric acid. Fluorides are used extensively throughout the steel and ceramic industries, and an application of sodium fluoride that has gained attention recently is the fluorination of municipal water supplies, thought to be a means of preventing tooth decay.

* * *

Returning from Paris with the first blueprints of the process to reach the U.S.A., Mr. Graham W. Parker, a member of the American Society of Mechanical Engineers and New York consultant of the Société d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electrique d'Ugine, said that savings of 30 per cent or more in fabricating costs could be effected with the new Ugine extrusion process for finishing steels. The Ugine process made it possible to handle steel like a plastic material, he claimed. Using the process, molten steel could be extruded in a hydraulic press in the most intricate forms and sections, eliminating many costly operations of forging and machining. A significant instance of the economy the method permitted was the fact that finished gears of alloy steel could be produced in only two operations.

* * *

Dr. Herman E. Ries, Jr., head of the physical chemistry section of the Sinclair Refining Company Research Laboratories, Harvey, Illinois, has been awarded the $3000 Ipatieff Prize in Chemistry for 1950. The 38-year-old chemist was cited for his contributions to the knowledge of catalysts, particularly those used in petroleum hydrocarbon conversion. He will receive the award at the 117th national meeting in Houston, Texas, next spring of the American Chemical Society, administrators of the award. Dr. Ries has been in the forefront of the physical chemists who have sought to explain the behaviour of catalysts in terms of their basic physical properties, such as surface areas and pore structures. His work on the mechanism of catalysts has contributed to longer life and greater yields of petroleum products.

* * *

Assigned to the Government by the inventor, Paul S. Roller, a new patent (U.S. No. 2,469,413) describing a process for preparing barium aluminate has been made available for royalty-free licensing by the Solicitor, U.S. Department of the Interior, Washington 25, D.C. The patent describes a rapid high-temperature synthesis of barium aluminate, barium sulphate and alumina being mixed in molecular proportions with small additions of sodium carbonate.

* * *

Patents for a new cast iron which can be bent or twisted have been granted to the International Nickel Company, according to a report made to the Gray Iron Founders' Society in Chicago, Illinois. The new iron is said to be much stronger and more shock-resistant than ordinary cast iron and to have many potential applications. It is expected to be of particular value in the motor vehicle making and the agricultural implements, machinery, oil, and railroad fields.

* * *

Free-flowing properties, permitting satisfactory dry mixing and handling, are claimed for a new grade of titanium dioxide which has been developed especially for vitreous enamels and the general ceramic field by E. I. Du Pont de Nemours & Company, Inc. The grade for use in vitreous enamels serves as an opacifier and is expected to have application in the ceramic field as well. Effective use of titanium dioxide has been made possible by recent developments in the method of manufacturing vitreous enamel, states E. I. Du Pont de Nemours. It is replacing other materials because of the economy in its use and the possibility of obtaining opacity with a thinner, more flexible film. The acid resistance of the enamel is said to be heightened. The new preparation is said to have a chemical purity equal to pigment grades.

HIGH-PRESSURE TUBING

16,300 p.s.i. at 1000° F.

ALLOY steel tubing which is claimed to withstand the extreme pressure of 10,300 p.s.i. at 1000°F. is included in the piping system produced by the Babcock and Wilcox Tube Company, Beaver Falls, Pennsylvania, for the coal-to-oil demonstration plants recently opened by the U.S. Bureau of Mines at Louisiana, Missouri.

The hydrogenation and synthesis processes involve high temperatures and unusually high operating pressures, in addition to the usual corrosion factor. The tubing used for valves and fittings, as well as the piping system of the paste preheater, splitting-phase unit and heat exchangers, includes sizes from 1 1/32 to 6⅝ in. outside diameter and .145 in. to 1.169 in. in wall thickness. There is also hot finished or cold drawn tubing in low carbon, AISI 1040, AISI 4130, B. & W. Croloys 5, 9M and 16-13-3 (type 316) grades.

A striking factor of the tubing furnished is the size of the wall compared with the outer surface of the heavy-walled Croloy 16-13-3 used in the high-pressure elevated temperature part of the installation. This tubing has 25/32 in. exterior surface by 1.169 in. wall thickness, with a polished interior surface.

The high pressure tubing used in the higher temperature range is made of chromium-nickel-molybdenum austenitic stainless steel, and was chosen in preference to other stainless steels because of its high creep strength.

COMMERCIAL ACTINIUM

Large-Scale Refining Starts in U.S.A.

THE first industrial production of the radioactive element actinium has been announced by Boris Pregel, scientist and engineer and president of the International Rare Metals Refinery, Inc., New York City.

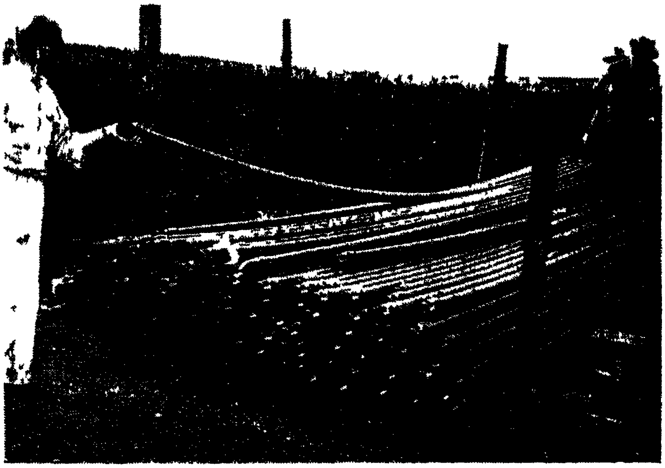
Actinium is about 150 times as active as radium, so that it is of great value to nuclear physicists in the production of neutrons. Generally, it has been obtainable only in sub-microscopic amounts. The success of Pregel and his technical staff in evolving a process for refining actinium industrially follows more than 50 years of effort by scientists all over the world to isolate the element in sizeable quantity.

Actinium (Ac, atomic weight 227, atomic number 89) is a decay product of uranium 235, the natural isotope of uranium 238 around which the entire atomic energy programme was created. One of its merits in industry is that it is much safer than radium and may be used on luminous dials and it also promises to yield vital applications in the field of medicine, especially in the treatment of skin diseases and superficial tumors, employing its strong β-ray emission (1-1.5 Mev.).

Actinium's mild gamma radiation can be screened by a thin shield of glass or sheet plastic material.

Actinium has a half-life of 13.5 years, a durability which gives it a distinct advantage over polonium as an alpha-ray emitter, which has a half-life of only 138 days.

LIGHT-WEIGHT PLASTIC PIPING



A 20-ft. section of Carbon B tubing, which is extruded from a special variety of a cellulose acetate butyrate plastic, easily lifted by an installation worker at a salt-water disposal well in Kansas (U. S. A.), where 3387 ft. of this light-weight piping (1½ tons) was used. It is claimed to be non-corrosive, and weighs only .826 lb. per ft. in 2½ in. diameter

The Chemist's Bookshelf

FIBRE SCIENCE. Edited by J. M. Preston, The Textile Institute, Manchester. pp. 341. 30s.

The importance of relating scientific theory with industrial practice was emphasised by the Cotton Working Party report which recommended that the universities and technical colleges assisted by running post graduate and refresher courses for the benefit of industrial scientists. The lectures which form the basis of this volume were designed to serve this purpose.

The 18 post advanced lectures were delivered by a panel of 13 lecturers during the first half of 1947 at the College of Technology, Manchester, in collaboration with the Regional Advisory Council for Technical and other forms of Further Education for Manchester and district. The material has been collected into the present volume by Mr. J. M. Preston, of the department of textile chemistry, Manchester College of Technology.

In the opening chapters the chemistry of cellulose, pectic acid and related materials are discussed, followed by a discussion of protein and synthetic fibres and methods of determining their molecular weights. In view of the information to be gained from X-ray diffraction studies this aspect and the optical properties of fibres receive consideration. It is now realised that both the amorphous and crystalline regions in fibres play their respective parts in determining the nature and reactions of fibres. Of those depending on the amorphous regions mention may be made of swelling, extensibility and crease resistance.

Few fibres are used in their raw state with the consequence that the operations of finishing and dyeing are of major importance. The fine structure of fibres in relation to these operations is fully dealt with and the book finishes with chapters on the chemistry of keratin fibres and of synthetic fibre forming polymers.

The present volume forms a well written and concise account of the recent knowledge of textile science and the text is freely illustrated with diagrams and plates. The book should prove of value both to those already engaged in, and those about to enter this field.

MODERN METHODS FOR THE ANALYSIS OF ALUMINIUM ALLOYS. By a committee of chemists convened by the Association of Light Alloy Refiners. 1949. London: Chapman and Hall, Ltd. Pp. 144. 13s. 6d.

Ten chemists present in this book a survey of the methods used for the analysis of aluminium alloys. Many of the methods finally approved by the committee are new, while others are modified versions of those already known, and a few are now standard. Procedures are given for dealing rapidly with large numbers of samples and schemes are described for the estimation of several elements from one weighing. Methods range from those requiring modern physico-chemical instruments, such as the polarograph and photometer, to those which may be carried out with the normal equipment available in the general chemical laboratory. The text is divided into four chapters: Gravimetric and volumetric methods; electrolytic methods; photo-polarographic methods. An appendix deals with less common elements and with composite schemes of photometric analysis. Eleven figures and numerous references give a good survey of the principles as well as of the literature on the subject.

EXPERIMENTAL PLASTICS FOR STUDENTS. C. A. Redfarn and A. Allcott. 1949. London: Iliffe and Sons, Ltd. Pp. 90. 10s. 6d.

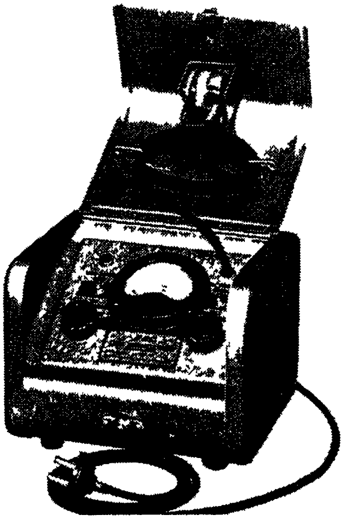
Among the many recent publications on plastics, this book is distinguished by originality in its purpose. It describes 36 practical exercises developed during the past 15 years in the plastics technology laboratory of the Borough Polytechnic, London, to help plastics students to an appreciation of the principles involved in the production and moulding of plastic materials. Most of the exercises can be carried out by any organisation which has a small set of rollers, a steam-heated and water-cooled press, a steam-supply at 150 p.s.i., and a chemical bench with ordinary laboratory apparatus. There are 23 line illustrations and five appendices with calculation and conversion tables.

Technical Publications

A STUDY of the hand-fired, natural-draught, Lancashire boiler and the magnitude of various losses due to inefficient operation has recently been made and is now available as Technical Paper No. 35, issued by the Fuel Research Station of the DSIR (HMSO, 1s.). The paper gives precise data to show the effects of varying load on efficiency and the effects of soot blowing, and describes methods to measure the cost of inefficient operation. Reference is also made to a practical means of avoiding unnecessary heat losses by the use of a simple, smoke-eliminating fire door. While the paper indicates that conversion of this type of boiler to pulverised-fuel firing can lead to some gain of efficiency, it concludes that, if correctly fired, this type of boiler fitted with the new fire doors may have a thermal efficiency upon which it is difficult to improve by adopting mechanical stoking.

THE latest recommendations by the British Standards Institution relating to containers are contained in the newly published B.S. 1596—Fibreboard drums for oversea shipment. This standard will enable users, transport authorities and others to specify drums suitable for carrying dry powders, crystals, solid and semi-solid materials to their overseas destinations. This first edition of the standard relates only to drums made entirely from fibreboard, but work is proceeding with a view to extending it to cover fibreboard drums with metal, wooden or plywood ends. Manufacturers are recommended by the BS to avail themselves of the facilities of the institution's certification mark scheme for drums conforming with this standard. Minimum side-wall and end strengths are given for a range of drums having cubic capacities up to 17,200 cu. in., equivalent to a maximum net weight of 448 lb. or 62 Imp. gal.

GOOD technical explanation and simple descriptions of some of the essential tests of glue—viscosity, water absorption, etc.—are given in a booklet "The Story of Animal Glue," now available from Alfred Adams & Co., Ltd., West Bromwich. The history of glue, its difference from gelatin, raw materials from which it is made, extraction processes, grading system, etc., are all covered.



Courtesy General Electric Co Ltd London

Improved meter for measuring the thickness of non-magnetic coatings such as paints, sprayed metal, vitreous enamel, provided they are on magnetic bases

MANIPULATION and treatment of high-speed steels are considered in an article by H. W. Pinder in the current issue of *Alloy Metals Review* (Vol. 7, No. 53), published by High Speed Steel Alloys, Ltd., Widnes, Lancashire. Three types are covered tungsten, tungsten cobalt, and molybdenum, and there are a number of reproductions of photomicrographs and various graphs.

AN important characteristic of synthetic resin glues is that they are highly reactive to heat. The hardeners developed for use with these glues promote rapid setting by chemical reaction, and, if heat is also applied, extremely short curing times are possible. Radio-frequency is being increasingly used by a number of woodworking concerns influenced by the fact that heat is applied immediately at the glue line. A short account of radio frequency heating and of its application to Aerolite K, is given in Bulletin 82 of "Aero Research Technical Notes," now available from the Technical Service Department, Aero Research, Ltd., Duxford, Cambridge.

THE first detailed technical record of fire fighting equipment available to deal with normal and emergency conflagrations anywhere in the United Kingdom appears in the 1950 edition of *Fire Protection and Accident Prevention Year Book* (Benn, Brothers, Ltd., 10s. 6d., post paid). This lists not only all public Fire Brigades and the appliances they have, but provides also a similar record covering fire-fighting units wholly maintained by industry and private sources.

The Year Book also contains information about brigades in the Commonwealth and Empire and in many foreign countries and legal and technical data.

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ANOTHER journal has been added to the group of 17 specialised publications produced by Benn Brothers, Ltd., in *The Ice Cream Industry*, the November issue of which appears for the first time from Bouverie House. The leading article pays tribute to Mr. Victor O'Neill who had been associated with the paper for the past 24 years.

PAINTS which indicate by a sharp, clear-cut change of colour the achievement of a predetermined temperature of a metal surface are manufactured by Synthetic & Industrial Finishes, Ltd., Watford. A pamphlet issued by J. M. Steel & Co., Ltd., which is the distributor of "Thermindex" paints, illustrates by colour photographs the various temperature effects. Many uses are claimed, of which application in heat treatment processes and in the hot working of light alloys are likely to be most attractive.

* * *

THE first comprehensive survey of all the research schemes in progress in the Caribbean area is contained in the Year Book of Caribbean Research, 1948, now published. The volume records that some 800 schemes and surveys are being undertaken. Schemes are classified by subject and territory and are divided into four main groups. The majority of schemes are related to agriculture, but a number are concerned with chemical technology, geology, medicine, engineering, etc.

Widening Use of Argon Arc Welding

ARGON arc welding* is one of the most recent developments of metal fabrication processes and new applications are continually being found for it.

In less than 10 years the process has developed from an interesting experimental effort in welding magnesium alloys, to one which can now be applied to most of the common metals and alloys. Many metallurgical, electrical and practical problems have been solved during this period, particularly those relating to the welding of aluminium and its alloys.

The main virtue of the argon arc process as far as aluminium is concerned is that welding can be carried out without the use of a flux and this enables fillet and lap welds to be used with confidence.

The main problem which was encountered in the early experiments on aluminium was that due to the rectification effect when using the a.c. argon arc. This has now been overcome from the practical point of view although it still requires considerable investigation before it is understood completely.

Modern equipment using specially designed transformers with a high open circuit voltage and condensers in series with the welding leads suppresses the rectification effect and enables satisfactory welding to be carried out.

Because of the cost of the argon gas, welding aluminium and alloys by the process is still relatively expensive for normal fabrication shops, but the introduction of mechanical welding with higher rates of travel considerably reduces costs, which may then be competitive. The application of the process to heavier aluminium sections in this country awaits the development of heavier equipment than is yet available.

The use of argon arc welding for stainless steel is proceeding with very little trouble and the process now competes in certain ranges of thickness with metal arc welding.

The welding of copper by the argon arc process, however, is still not satisfactory, mainly because of the porosity encountered in the finished welds. Similar trouble arises when welding nickel and Monel, but Nimonic and Inconel appear to give satisfactory welds.

A new development of the process in America consists in replacing the tungsten electrode by aluminium wire which is fed rapidly. This makes the process less cumbersome and permits ready welding in the overhead and other difficult positions.

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* Summary of a paper presented by W. K. B. Marshall at the annual autumn conference of the Sheet and Strip Metal Users' Technical Association

◆ HOME ◆

7000 Bags Destroyed

Fire last week at the premises of the British Oil and Cake Mills, Ltd., Greenock, destroyed 7000 jute bags. It was caused by incandescent metal from a welding machine landing on a conveyor belt.

Post Office Telephones

In four years since the war, the Post Office has installed 2.25 million telephones, an increase, after allowing for those given up, of over 1.1 million. There are now 5 million telephones in use throughout the country and more than half a million applicants are on the waiting list.

Transport of Petroleum Regulations

Minor changes in the Petroleum Spirit (Conveyance) Regulations, which became effective this month, relate to the obligation of a driver to remain " in or in close proximity to " a road tanker and permit the use of up to 24 volts in the vehicle's electric lighting equipment.

Charge for Prescriptions

Its opinion that the proposed shilling charge on each prescription under the National Health service will not be effective in preventing misuse of the service has been put before the Prime Minister by the Pharmaceutical Society of Great Britain, representing 26,000 chemists. The society maintains that the charge will be prejudicial to persons genuinely needing medical attention.

Changed Oils and Fats Prices

The price of Empire stearine in softwood barrels is reduced from £119 to £117 15s. a ton, c.i.f., during the 8-weeks period from November 6 to December 31, states the Ministry of Food. One unrefined oil price is also increased: of cotton acid oil from £93 to £94 a ton (naked ex works) during the four weeks November 6-December 3. All other unrefined oils and fats remain at the same price during that period.

Zinc Prices Up

The price of good ordinary brand zinc was increased by £2 from £83 10s. to £85 10s. per ton delivered as from Thursday, November 3. Prices of other grades varied accordingly. The zinc oxide manufacturers announced that from the same date, the price of zinc oxide, in lots of not less than two tons, delivered, was increased by £1 10s. New prices were: zinc oxide (Red Seal), £82 5s.; zinc oxide (Green Seal), £83 15s.; zinc oxide (White Seal), £84 15s.

" C.A. " at the Building Exhibition

THE CHEMICAL AGE and other journals of the Benn Brothers group will be represented at the Building Exhibition, Olympia (November 17-December 1) on Stand No. 462, Grand Hall Gallery.

BTH Birmingham District Office

British Thomson-Houston Co., Ltd., announces that its Birmingham district office staff is now situated in new premises at Geoffrey Buildings, John Bright Street, Birmingham, 1. The telephone number remains unchanged, Midland 6335.

Hospital Pharmacists Visit Works

A party of chief pharmacists from hospitals in the London area and in Scotland recently made a two-day visit as guests of Evans Medical Supplies, Ltd., to the company's principal establishments at Liverpool and Runcorn. The tour included a dinner party in Liverpool given by the directors and managerial staff.

Soap Rationing

The increase in individual soap rations, from seven to eight rations per eight weeks for ration books RB1 and RB4 and eight to nine rations for holders of ration books RB2, took effect on November 6. The new ration will be obtainable in the second four weeks of each 8-week period, starting with ration period No. 8 which begins on December 4.

Coal Production

Britain's output of deep-mined coal last week, at 4,253,200 tons, was the highest this year. It compared with 4,165,400 tons in the previous week and 4,437,000 in the best week of 1948. The average weekly output so far this year of 3,861,800 tons is still below the amount required to reach the various targets set. In the last full pre-war year the weekly average was 4,353,300 tons.

World Resources

The main item on the agenda of the Parliamentary and Scientific Committee meeting in November will be a discussion of the recent World Resources Conference at Lake Success, with special reference to the possible implementation of President Truman's " Fourth Point." The chairman, Mr. M. Philips Price, M.P. (who attended the conference) and some other distinguished British scientists who were there have been invited to address the committee and initiate a discussion.

OVERSEAS

Natural Gas for Atomic Plant

A 170-mile underground pipeline will be completed in December to carry natural gas from Greenbriar to the United States atomic plant at Oakridge, Tennessee.

70 Reported Killed in Uranium Mine

Seventy German miners were killed in a uranium mine explosion near Zwickau, in the Soviet zone, when a powder supply blew up, the Western licensed newspaper, *Social Democrat*, announced on November 6.

Izmir International Fair, 1950

The British Chamber of Commerce of Turkey announces that it will again take part in organising a British pavilion for the Izmir International Fair to be held from August 20 to September 20 next year. At this year's Fair the British pavilion contained 49 stands and products of approximately 129 manufacturers.

Canadian Trade Press Visit to U.K.

To ensure that U.K. goods shall be better known in the Dominion, six representatives of the Canadian trade Press have been invited by the Government to make a three week's tour of British industries. After a week in London, the party will spend a fortnight in the provinces and Scotland where they will meet leading exporters and industrialists and visit factories.

Argentine Tung Oil

The 1949 harvest of Argentine tung nuts is expected to be between 55,000 and 60,000 metric tons compared with 40,000 to 45,000 tons last year, according to the United States. Department of Commerce. This year's crop may yield 8400 tons of oil compared with 6000 tons last year. Declining availability of tung oil from China heightens interest in the Argentine supply.

Norway's Domestic Uranium Ore

Domestic sources of uranium are stated as probably sufficient to supply Norway's first atomic pile now under construction, for which the equivalent of some £750,000 has been earmarked. Uranium for this project at present comes from felspar deposits in Southern Norway. No large-scale uranium search has been started, though prospectors have been active in areas where uranium is thought most likely to occur. Most of the richer samples have come from felspar districts near Setesdal and Kristiansand.

Buna for E. Germany?

The Buna works in the Eastern zone of Germany is reported to be exporting synthetic rubber on an increasing scale, chiefly to Czechoslovakia, Poland Sweden and Switzerland.

New Indian Mica Standards

The Indian Standards Institution has recently prepared two new standards for mica with the object of ensuring uniformity of quality of this important item in India's export trade.

Uranium Reported in W. Germany

Dr. Albert Kummer, a German engineer, claims to have found traces of uranium ore deposits in the Fichtel mountains, in the American zone of Germany, near the junction of the Soviet zone and Czechoslovak borders. It is the first report of uranium in Western Germany.

Australia to Use German Steel Press

The most important single item of reparations obtained by Australia from Germany is a 5100-ton hydraulic forging press, valued at £250,000. It is being made available to the Commonwealth Steel Company of Newcastle, New South Wales, on a rental basis, and will perform forging work on propellor shafts, steam boilers, and other articles previously imported.

Aluminium Electric Cable

An Australian company at Port Kembla, New South Wales, is now manufacturing nine miles of steel-cored aluminium conductor cable for one of the largest high voltage power-line spans in the world. It is to stretch for a mile and a third across the Eildon Reservoir in the State of Victoria, and is being made for the State Electricity Commission for the six conductors of the 220,000 volt Kiewa-Melbourne transmission line.

U.S. Aluminium and Bauxite

Primary aluminium production in the U.S.A. during the first six months of 1949 was 323,126 short tons, over 6 per cent more than the quality produced in the corresponding period of 1948, states the U.S. Bureau of Mines. Bauxite production from U.S. mines in the second quarter of this year is reported to have been 332,553 long tons (dried equivalent). This was about 5 per cent more than was raised in the first quarter. Over 96 per cent of the April-June yield came from Arkansas.

PERSONAL

BIRMINGHAM University has announced two important new appointments in its metallurgical department. Dr. A. H. Cottrell becomes the University's first professor of physical metallurgy, and Dr. Geoffrey Vincent Raynor is appointed its first professor in metal physics. Their appointments raise the number of chairs in metallurgy at Birmingham to four. Prof. A. J. Murphy, who was recently appointed to succeed Prof. L. Aitchison as professor of industrial metallurgy, is to take up his duties at the beginning of next year. Prof. D. Hanson, who has been responsible for the development of metallurgy in Birmingham University for many years, remains as director of the departments of metallurgy and industrial metallurgy.

The following officers were elected for the coming year at the 31st annual general meeting of the Chemical Club held recently in London: J. Davidson-Pratt (president); A. J. Amos (chairman of the executive committee); E. H. T. Hoblyn (hon. treasurer), J. Hoy Robertson (hon. secretary). Members of the committee: E. Chilman, W. Dixon, F. A. Greene, F. J. Griffin, C. W. Herd, O. Jones, S. I. Levy, L. R. B. Pearce, W. Preston, J. F. Ronca, Trevor A. Smith.

Dr. Frederick D. Rossini, chief of the Thermochemistry and Hydrocarbon Section of the U.S. National Bureau of Standards, has been appointed professor and head of the chemistry department at the Carnegie Institute of Technology, Pittsburgh, Pennsylvania. The appointment becomes effective July 1, 1950. Dr. Rossini is the United States member and chairman of the Standing Committee on Thermochemistry of the International Union of Chemistry.

Mr. R. F. Buller, who is in charge of the solvents section of Sales Development Department, Shell Chemical Corporation, New York, is in England on a visit to Shell Chemicals, Ltd. He has been in close contact with the lacquer industry in the United States for the past ten years and has been directly concerned with the corporation's technical service programme. He spoke, this week, to the London Section of the Oil and Colour Chemists' Association on "Recent Experiences with Lacquer Solvents in the United States."

At the recent annual general meeting of the British Colour Makers' Association the following officers and council for the ensuing year were elected: Chairman: Mr. J. H. Grimshaw (Horace Cory & Co., Ltd.); vice-chairman: Mr. H. Gosling (Cornbrook Chemical Co., Ltd.); hon. treasurer: Mr. C. G. A. Cowan (Cowan Bros. (Stratford), Ltd.); council: Mr. C. M. Beavis (Golden Valley Ochre & Oxide (Colours) Co., Ltd.); Mr. F. Burrell (J. W. & T. A. Smith, Ltd.); Mr. H. Gosling (Cornbrook Chemical Co., Ltd.); Mr. J. H. Grimshaw (Horace Cory & Co., Ltd.); Dr. H. Samuels (I.C.I., Ltd.); Mr. V. Watson (Cromford Colour Co., Ltd.; Mr. H. A. Wilson (The Derby Oxide & Colour Co., Ltd.); Mr. C. E. Young (Hardman & Holden, Ltd.); secretary: Mr. Allan J. Holden.

The Colwyn Medal for 1949 has been awarded by the Institution of the Rubber Industry to Mr. E. A. Murphy, manager of the general development division at Fort Dunlop, for his work in connection with the development of latex.

British Industrial Solvents, Ltd., has announced the appointment of Mr. Leonard C. West as an assistant sales manager, in charge of the sales development department at the London head office, 6 Cavendish Square, W.1.

Mr. James Harnaman, a director of Laporte Chemicals, Ltd., who has recently been appointed resident director of the company's Baronet Works, Warrington, is to be succeeded as works manager at Luton by Mr. E. O. Rounsefell.

Obituary

THE death in the U.S.A. last week of Mr. Solomon R. Guggenheim removed the last of a family whose operations in the metal and mining world placed the U.S.A. in its present position of leadership in world metal affairs. Mr. Guggenheim, who was 88, was the last of seven brothers, who, as Guggenheim Bros., widely exploited the non-ferrous metal resources of Latin America and were reputed at one time to control almost a half of the world's copper supplies. A substantial proportion of the vast earnings from their operations was devoted to cultural and scientific objects in the U.S.A.

Next Week's Events

MONDAY, NOVEMBER 14

Institute of Physics

Birmingham: James Watt Memorial Institute, Great Charles Street, 7 p.m. (With Institution of the Rubber Industry). Papers on "Behaviour of Rubbers at Low Temperatures."

Society of Chemical Industry

Bradford: Technical College, 7.15 p.m. (With other associations). Edward Race: "The Rotting and Rot Proofing of Textiles."

The Royal Institute of Chemistry

Leeds: University, 6.30 p.m. Prof. J. W. Cook (president): "Synthetic Analgesics and Anti-spasmodics."

TUESDAY, NOVEMBER 15

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. (Electronics Group). G. Bradfield (National Physical Laboratory): "The Generation and Launching of Ultrasonic Waves."

Institute of Petroleum

Manchester: Engineers' Club, Albert Square, 6.30 p.m. F. Green: "Greases."

WEDNESDAY, NOVEMBER 16

The Royal Institute of Chemistry

London: Royal Society of Medicine, 1 Wimpole Street, W.1, 6.30 p.m. Annual general meeting.

Dublin: Trinity College, 7.45 p.m. D. W. Kent-Jones: "What is Our Bread Made From?"

Chemical Engineering Group (SCI)

Newcastle: (With the Newcastle section, SCI). Dr. G. F. Whitby: "Planning and Design of a Chemical Factory."

Institute of Metals

London: The Royal Institution, Albemarle Street, W.1, 10 a.m. One-day symposium on "Metallurgical Applications of the Electron Microscope." (With other associations).

Incorporated Plant Engineers

Bristol: Grand Hotel, 7.15 p.m. (Western Branch). E. G. Ritchie: "Factors Influencing the Choice of Boiler Fuels."

THURSDAY, NOVEMBER 17

The Chemical Society

London: Institution of Mechanical Engineers, Storey's Gate, S.W.1, 7.15 p.m. Centenary lecture. Dr. M. Magat (Paris): "Radiation Induced Polymerisation."

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. Special general meeting to consider the annual report of the council.

Building Trades Exhibition

London: Olympia. Daily (until December 1).

Incorporated Plant Engineers

Liverpool: Radiant House, Bold Street, 7 p.m. (Liverpool and North Wales Branch). Whitley Moran: "Repair and Maintenance of Industrial Buildings."

Institute of Physics

London: Institution of Electrical Engineers, Savoy Place, W.C.1, 5.30 p.m (With the Institution of Electrical Engineers and the Education Group). Discussion: "The Education and Training of Technologists."

Textile Institute

Manchester: 16 St. Mary's Parsonage, 7.15 p.m. F. Happey (Courtaulds, Ltd.): "A New Approach to the Problem of the Structure of Cellulose and Its Derivatives."

Oil & Colour Chemists' Association

London: Manson House, 26 Portland Place, W.1, 7 p.m. P. J. Gay: "Accelerated Weathering, So-Called." (Repeated, Birmingham, Friday, November 18)

Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.30 p.m. Dr. F. Roffey: "The Development of Chemical Processes."

FRIDAY, NOVEMBER 18

The Chemical Society

South Wales: Swansea University College, 5.30 p.m. (With University College of Swansea Students' Chemical Society) Prof. M. G. Evans: "The Formation and Reactions of Free Radicals in Solution."

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. B. N. Watts: "The Application of Infra-Red Detectors."

Atomic Scientists' Association

London: University College, Gower Place, W.C.1, 6 p.m. Dr. W. J. Arrol: "Industrial Uses of Radioactive Substances."

SATURDAY, NOVEMBER 19

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. (North Western Branch). N. Swindin: "The Growth of the Chemical Industry in the Manchester District."

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ANTI-MISTANT, LTD., Sidcup, chemical manufacturers, etc. (M., 12/11/49.) October 11, £3000 charge, to Northern Assurance Co., Ltd.; charged on premises known as Rectory Works, North Cray. *Nil. September 6, 1946.

SCRIVENS, LTD., Birmingham, manufacturing chemists. (M., 12/11/49.) October 12, mortgage to Scottish Amicable Building Society securing £1950 and any other moneys, etc.; charged on 28 Westwood Road, Sutton Coldfield. *Nil. March 14, 1949.

SYNTHETIC & INDUSTRIAL FINISHES, LTD., Watford. (M., 12/11/49.) October 13, £5000 debenture, to S. W. Kendall, Watford, and another; general charge. *Nil. December 31, 1947.

New Registrations

Carnegie Bros. (1949), Ltd.

Private company. (474,510). Capital £2500. Manufacturing chemists, oil and colour men, etc. Directors: D. M. B. Carnegie, M. Carnegie. Reg. office: 44 Tewin Road, Welwyn Garden City, Herts.

Jefferies Chemical Company, Ltd.

Private company. (474,426). Capital £100. Manufacturing chemists. Directors: H. C. Jefferies, N. P. Widdowson. Reg. office: 21 Bride Lane, E.C.4.

Increase of Capital

The following increase of capital has been announced: GENERAL TRADE & CHEMICAL EXPORTS CO., LTD., from £1000 to £5000.

$4.1 M. for French Oil Projects

THE continuing policy of the Marshall aid administrators to facilitate large expansion of European oil refining capacity is reflected in the recent decision of ECA to release $4.1 million to finance modernisation and expansion plans of French oil refining industry, the total cost of which is estimated at $44 million. This is the second Marshall Aid allocation in the second half of the current year. ECA granted towards the end of August $3.9 million for the carrying out of expansion of the Donges, near Saint-Nazaire, plant, of the Raffineries Françaises de Pétroles de l'Atlantique and of the Compagnie Française de Raffinage at Gonfreville (near Le Hâvre) and in La Mède (Marseilles).

The latest allocation of dollars will benefit three more French oil companies—the Société de Raffinage du Pétrole Shell-Barre, which plans to transfer the capacity of its Pauillac refinery, near Bordeaux, largely destroyed during the war, to its Berre refinery. The annual capacity of the Berre plant is to be increased by 800,000 tons to 2.33 million. The transfer and expansion will cost about $31.7 million, of which $1.85 million will be provided by ECA. The other companies to receive ECA aid are the Compagnie de Raffinage de Pétrole "Socony-Vacuum Française" ($850,000), and the Standard Française de Pétrole ($1.4 million).

It is expected that most of this dollar aid will be used for the purchase of specialised plant and equipment in the U S.A.

New Insurance Machine

A MECHANICAL innovation in office equipment, the Neopost insurance machine, has received the approval of the Ministry of National Insurance. It has been adopted by several large firms in the chemical and allied trades. The machine does away with the need to purchase and affix stamps on insurance cards, as it prints an impression direct on to the card, and meters keep an accurate record of the contributions.

Payment of contributions is made direct to the Ministry periodically by cheque, so that the handling of large sums of cash is avoided and no stamps have to be bought and safeguarded.

The Stock and Chemical Markets

A FRESH fall in British funds, which brought 2½ per cent Treasury Bonds and 3 per cent Gas and Transport stocks to new low levels, has made for renewed caution in stock markets. The fall in Gilt-edged, mainly confined to long-dated stocks, has followed the higher interest rates charged by the Agricultural Mortgage Corporation. This latest illustration of the trend to dearer money has increased the view that a higher bank rate may be inevitable early next year.

Short-dated stocks were steady, helped by rumours that the 1¾ per cent Exchequer Bonds, which fall to be repaid next February, may be offered conversion into a new "tap" loan, terms of which may shortly be announced.

Industrial shares have been uncertain. Rising costs of materials, it is feared, will mean reduced profits for many industrial companies if continued over the next few months.

Imperial Chemical eased further to 42s. 1½d., Dunlop Rubber were 60s. and Monsanto Chemical 51s., while Fisons changed hands around 27s. 6d. Shares of companies connected with plastics had a fresh relapse, British Xylonite falling back again to 53s. 9d. after rallying to 57s. 6d. Kleemann 1s. shares eased to 8s. 4½d. on the reduced profits and cut in the dividend from 240 per cent to 140 per cent. De La Rue were 20s. 9d. and elsewhere the 4s. units of the Distillers Co. were 16s. 4½d. "ex" the share bonus. British Glues & Chemicals receded to 17s. 6d. with the general trend of markets, British Aluminium remained at 40s., but Turner & Newall moved lower to 72s. 9d. and United Molasses were 36s. 6d.

Boots Drug, after rising, fell back to 47s. 6d., British Drug Houses were 6s. 9d., but elsewhere iron and steels were helped by the industry's fresh production records. United Steel rallied to 25s. 6d., Colvilles to 31s. 6d., Hadfields to 25s. 3d., while Staveley firmed up to 76s. 6d. and Bolsover have been firm at 60s. In the event of nationalisation iron and steel shares should be worth "take-over" valuations; and in most cases current prices are well below these levels.

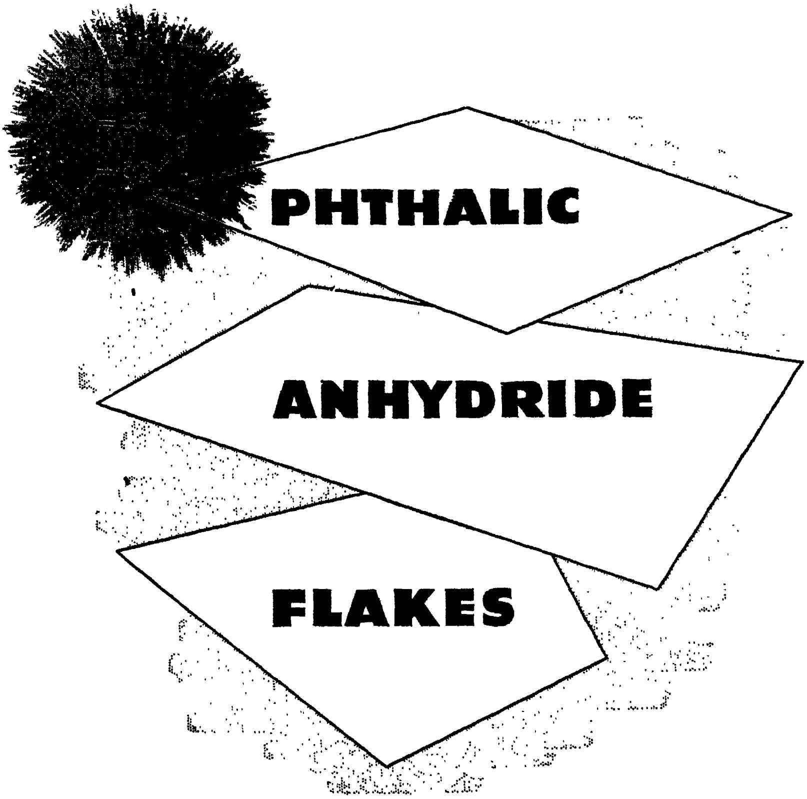
Triplex Glass 10s. ordinary have been steady at 17s. 6d., at which there is a not unattractive yield on the basis of last year's 10 per cent dividend. The export drive by the motor-car industry foreshadows bigger demand for safety glass. In other directions, Glaxo Laboratories have been firm at around £18¾, the market in the shares still being governed by the pending share bonus recently announced. Oils have been easier with Shell at 67s. 6d., Anglo-Iranian £7 and Trinidad Leaseholds 24s. 3d.

Market Reports

THE demand for industrial chemicals continues to be fully maintained and a fair amount of new business has been put through. Contract deliveries to the main consuming industries are reported well up to schedule with buyers showing increasing interest in contract replacements. The outlet in the export field remains good. The demand for the potash chemicals continues at recent levels and there has been no easing in the demand for the soda compounds, quotations for which remain unchanged. In other directions there has been no special feature and prices generally have a firm undertone. Although there has been little change in the position of the coal tar products, rather more interest is being displayed in the market, particularly for the tar acids. Pitch is again in good call on home and export account.

MANCHESTER.—The textile and other principal chemical using trades in Lancashire and the West Riding of Yorkshire are well employed and there has been no sign of contraction of demand for heavy chemical products. Soda ash and the other alkalis, as well as the potash, ammonia and magnesia compounds, are being taken in the home market in good quantities, and there is a fair amount of fresh inquiry for shipment to overseas. In the market for the by-products, the light materials seem to be the most active.

GLASGOW.—The Scottish chemical market has continued to be unsettled by the uncertainty of prices. A further increase in the price of petroleum products has been notified this week, and some heavy buying took place. Prices of products affected by the metal market have also been subject to a number of increases. The volume of business being transacted, however, continues on a fairly good scale and shows a steady increase over previous years. In the export market little in the way of tangible results as yet has resulted from the devaluation of the pound sterling. It is doubtful, as far as Scottish chemicals are concerned, whether much advantage is likely to be obtained.



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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the preparation of chloral from chloral alcoholate.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 2 1946. 629,699.

Process for the manufacture of 3-methoxy-pyridine and derivatives thereof.—Roche Products, Ltd., A. Cohen, and E. G. Hughes. July 21 1947. 629,423.

Soft solder for aluminium and aluminium alloys.—Soudalco. March 22 1946. 629,425.

Process for the preparation of water-soluble dyestuffs of the phthalocyanine series.—Sandoz, Ltd. Aug. 1 1946. 629,488.

Manufacture of oil-modified alkyl resins. —I.C.I., Ltd., D. Atherton, and J. K. Lovell. Aug. 13 1947. 629,490.

Decomposition of organic peroxides.—Distillers Co., Ltd., B. V. Aller, R. H. Hall, and R. N. Lacey. Aug. 21 1947. 629,429.

Preparation of monochloromethylpentamethylsiloxane.—Dow Corning Corporation. Feb. 10 1947. 629,491.

Process for the manufacture of 2 : 3 : 4-triamino - pyridin. — Roche Products Ltd. (F. Hoffman-La Roche & Co., A.G.). Sept. 23 1947. 629,439.

Process for the manufacture of 2-amino-6-hydroxy-8-(hydroxymethyl) - pteridine. Sept. 24 1946. 629,440.

Process for the manufacture of an amino pyrido-imidazole.—Roche Products, Ltd. (Hoffman-La Roche & Co., A.G.). Sept. 23 1947. 629,441.

Nickel alloy castings.—Mond Nickel Co., Ltd. Oct. 7, 1946. 629,574.

Manufacture of pyridoxin.—Roche Products, Ltd., and A. Cohen. Oct. 9 1947. 629,450.

Colouring of highly polymeric linear esters.—I.C.I., Ltd., R. Hardwick, and E. Waters. Oct. 20 1947. 629,452.

Corrosion-resistant articles. — Mond Nickel Co., Ltd., E. C. Rhodes, and D. W. Rhys. Dec. 1 1947. 629,581.

Treatment of impurity-containing solutions.—J. J. Naugle. Dec. 23 1946. 629,899.

Method for sweetening hydrocarbon liquids containing mercaptans.—Pure Oil Co. Dec. 6 1944 629,914.

Process for the manufacture of halogenated derivatives of the naphthoquinone series.—P. May. (Sandoz, Ltd.). July 22 1947. 629,706.

Distillation of acid-treated mineral oils. —Standard Oil Development Co. Oct. 3 1946. 629,711.

Oxo synthesis process.—Standard Oil Development Co. Dec. 6 1946. 629,915.

Ceramic dielectric compositions.—C. E. Every. Aug. 26 1947. 629,713.

Preparation of mono-chloromethyl silicon chlorides.—Dow Corning Corporation. Feb. 10 1947. 629,719.

Temperature recording devices.—British Thomson-Houston Co., Ltd. Nov. 27 1946. 629,744.

Methods of dephosphorising iron and steel.—Soc. Anon. des Hauts-Fourneaux de la Chiers. June 24 1947. 629,745.

Cemented carbide body having a soft metal insert and a method for securing the insert therein.—British Thomson-Houston Co., Ltd. Nov. 20 1946. 629,757.

Coating compositions containing synthetic resins.—Westinghouse Electric International Co. Dec. 7, 1946. 629,787.

Equipment for collection and transmission of the energy of a moving fluid.—J. M. L. G. De Camaret. Dec. 12 1946. 629,798.

Electrode holders for oxy-electric cutting of metal.—Rockweld, Ltd., D. J. W. Boag, and J. L. Hamilton. Dec. 8 1947. 629,806.

Joints for forming a gas-tight connection between two axially aligned tubular elements.—Rockweld, Ltd., D. J. W. Boag, and J. L. Hamilton. Dec. 8 1947. 629,807.

Heat and acid resisting iron alloy.—E. H. Schwarz. Dec. 8 1940. 629,859.

Carburisation of iron and iron alloys.—General Electric Co., Ltd., and D. M. Dovey. Dec. 30 1947. 629,879.

Production of high grade aviation fuels from crude petroleum oils.—Anglo-Iranian Oil Co., Ltd., and D. A. Howes. Feb. 24 1941. 630,245.

Production of motor fuels of high octane number.—Anglo-Iranian Oil Co., Ltd., and D. A. Howes. Feb. 24 1941. 630,246

Method and apparatus for heating flowin gases or vapours.—Industrikemiska A/B, and J. O. Naucler. Nov. 28 1941. 630,184.

Dehydrohalogenated derivatives and process of producing the same.—G. L. Martin Co. Feb. 15 1945. 630,248.

Process for the production of calcium magnesium phosphates.—E. M. Vermehven. April 1 1946. 630,196.

Ketones

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As raw materials they are employed in the production of synthetic perfumes, drugs, flavourings and resins, and for an increasing number of other uses depending on the reactive carbonyl group.

	Molecular Weight	Boiling Point	Pounds per gal. at 20°C
Acetone	58·1	56·1°C	7·91
Methyl Ethyl Ketone	72·1	79·6°C	8·07
Methyl Isobutyl Ketone	100·2	115·9°C	8·02
Diacetone Alcohol	116·16	166·0°C	9·38

Technical Information Sheets are available on request.

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KG1

APPLIED CHEMISTRY

Series of Post-Graduate Lectures

OF interest to some chemists, research workers and others is a course of post-graduate lectures in applied chemistry to be held at Acton Technical College, during the Spring term, 1950.

The lectures, details of which appear below, will be given on Friday evenings at 7.30 p.m., beginning on January 13, 1950.

C. C. Hall will open the series with two lectures (January 13 and 20) on "The Fischer-Tropsch and Related Processes."

"The Theory of High Polymer Synthesis," will be covered by W. Davey in the next two lectures (January 27 and February 3).

The remaining eight lectures will be given by W. H. Stevens, four on "Polymers, Scientific and Industrial Classification, Plastic Materials, Sources, Properties as related to Utilisation and Modern Industrial Processes" (February 10, 17 and 24, March 3); and four devoted to "Modern Methods of Testing and Analysis of Plastic Materials, Special Applications, Factory Proceedure and The Plastics Industry" (March 10, 17, 24 and 31).

U.S. COKE FIGURES

Largest Distribution on Record

AMERICAN coke-plant operators in 1948 distributed 74,214,856 tons, the largest quantity of coke on record, states the U.S. Bureau of Mines. Requirements of metallurgical grades by the iron and steel industry (then operating at its highest level since 1944) accounted for 85 per cent of the total from ovens.

Blast furnaces also used a larger tonnage than ever before, due mainly to poor fuel efficiency. The quantity of coke used in the manufacture of water gas has been increased nearly threefold since 1936.

A decline of 11 per cent, however, in the amount of coke used for other industrial needs—non-ferrous smelting operations, chemical process industries, etc.—is recorded in a comparison with 1947. Coke distributed for domestic consumption was the lowest in 24 years.

Exports of coke and breeze in 1948 decreased 9 per cent from 1947 and were the lowest in seven years. The exportation of metallurgical coke, the grade in shortest supply, has been restricted to the Western Hemisphere.

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Widening Student Exchanges

FEW things are more heartening in a period in world affairs in which steps to closer accord are hesitant and encompassed with difficulties—which some countries are intent on magnifying—than the little publicised exchange of industrial and university students of most of the European countries. This reassuring undertaking—reassuring because it knows nothing of deadlocks or wounded national pride and forms a bridge which becomes firmer and broader with use—is the far-sighted mission of IAESTE (the International Association for the Exchange of Students for Technical Experience is its deceptively formidable title), which has completed and surveyed a second year's experience of sending forth or receiving the student technicians of 10 Continental countries.

Some satisfaction is encouraged by the knowledge that Great Britain, represented by the Imperial College, was, with France, one of the initiators of this liberal scheme and continues to be one of the most active in promoting its extension. To-day the scheme has the warm backing of—in addition to Britain and France—Austria, Belgium, Denmark, Finland, the Netherlands, Norway, Sweden and Switzerland, which collectively arranged the reception during last summer in each other's industrial plants and training centres of 1236 young people anxious to study industrial techniques not readily available to them in their own countries. The summer before, the first in which the scheme operated, 920 students gained their first insight of another people's industry and technology. There is every indication that the heightened success of the second year's enterprise and the plans now being formulated in the light of closer experience will ensure in 1950 an even larger increase in this mutually attractive form of international exchange.

Great Britain can safely be expected to play a more active part than any other country in this multilateral exchange, as she has done in the past. Last year this country extended hospitality to 314 students, substantially more than any other country, except possibly Sweden (288), and in 1948 received 191. That hospitality was very generously requited, for in both years British students outnumbered those of any other country in this search for new horizons. Last summer 285 were cordially received in foreign factories and homes and by all accounts gained and gave lasting impressions the value of which cannot be

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measured entirely in terms of industrial proficiency.

This is so manifestly one of the most fruitful ways of implementing the ideals of UNESCO in more directions than one that it may come as a surprise to many to observe that IAESTE is not one more of the many offshoots of the international organisation. UNESCO's benevolence towards the student organisation is, of course, assured and its interest has been reflected in the attention it gave to a special report on IAESTE, presented in June and subsequently publicised by the international secretariat, and to a further report given by the general secretary to the meeting of experts in Paris last September. As a sequel, the executive of UNESCO decided that month to recognise the student organisation as the competent body for future consultation. The co-existence of two such bodies sharing interests so nearly identical must appear as an anomaly against the present trend to seek increasing cohesion in administration of European affairs. The explanation is no doubt to be found in the brief comment by IAESTE, that its decision, last January, to remain a separate entity, without affiliation to any larger international organisation, was correct. That policy is said to have considerably simplified general organisation and secured the indispensable condition that each nation's committee should have perfect freedom of action. What has been achieved by essentially voluntary and more or less spontaneous enterprise is the best evidence that the present policy is the right one.

The fields in which IAESTE has been able to organise industrial exchanges, wide as they are, are restricted by the short time the scheme has been in existence and the fact that the whole depends upon generous collaboration of individual industries in the countries concerned. That involves accepting as temporary employees untrained or semi-trained people having everything to learn and little to give—except their precious contribution to international good fellowship. Analysis of distribution of students among industries reveals the expected result that mechanical and electrical engineering was the objective of most (408 and 216 students, respectively). Third place in order of popularity of the 15 industries listed was taken by chemical engineering, which significantly attracted five more than did civil engineering—187. ' Great Britain's contribution to that training was

(*continued on page* 694)

Notes and Comments

Wages and Profits

TIMELY and forceful was the reminder given last week—by a spokesman usually not prone to give political advice—that partisan treatment of labour at the expense of industries cannot be indulged in without inviting economic disaster. Lord McGowan, Imperial Chemical Industries chairman, presented a Bristol audience with a catalogue of some of the crippling impediments which still often render the ideal of virile competition in overseas markets incapable of being realised. He touched also on the much publicised topics of industrial profits and personal incomes, calling attention to the increasing tendency to confuse the two and burden both without much distinction between their very different functions. Distributed profits, as he pointed out, are the only ones entering into personal incomes, and he showed that the reputed vast increase in distribution is mostly imaginary.

A Contrast

"IN 1938," said the I.C.I. chairman, "wages amounted to £1735 million, while in 1948 they had reached the total of £3975 million, or an increase of £129 per cent. Compared with these figures the distributed profits of companies amounted to £506 million in 1938 and to £730 million in 1948, an increase of 44 per cent. Taking the original totals as a starting point, the *Economist* has calculated that if an adjustment is made for direct taxation, wages show an increase of 116 per cent on 1938, while distributed profits of companies show an increase of only 37 per cent. Do these figures reveal a picture of shareholders growing rich at the expense of wage earners? In the light of these figures, I suggest that the latest increase in the distributed profits tax is a vindictive piece of legislation, without justification of any kind."

Grains of Paradise

IN a period characterised by uncertainty about a great many things there is satisfaction to be had from contemplation of the continuity of some undertakings, such as the voluntary work of experts to produce the British Pharmaceutical Codex, the fifth monumental edition of which has just been launched. Because of war, 15 years have passed since its predecessor was completed. Completed is perhaps too strong a word, for in normal times the issue of one edition merely marks the beginning of the next. Since its first appearance more than 40 years ago, the Codex has supplied standards for drugs and preparations not included in the "British Pharmacopœia," covering galenical standards, ligatures and sutures, pharmaceutical chemistry, pharmacognosy, and pharmacy and surgical dressings. Seven sub-committees helped in the production, which shows considerable revision in contents and methods of presentation. Since 1934, the Codex has been kept up to date, as far as possible, by seven supplements issued between 1940 and 1945. Mr. F. C. Denston (now deputy secretary to the British Pharmacopœia Commission) who was appointed editor on the death of Mr. C. E. Corfield in 1945, last week gave to the Pharmaceutical Society a good account of the new volume. The work is divided into seven parts, containing many new monographs and some 250 new preparations. Almost inevitably, there have been minor criticisms of detail, but there was unanimous agreement on the fine work accomplished by Mr. Denston in co-ordinating and sifting so formidable a mass of material and keeping a proper balance and proportion. There is a whiff of nostalgia, as well as evidence of continuity, about this new Codex. The former is on account of numerous excisions from Appendix 12 of noble "antiques." Pharmacists of the old school may well shed a decorous tear at the disappearance of such romantically descriptive entries as "Prayer Bead," "Mad Weed" and "Grains of Paradise." There is no romance about cerevisiæ fermentum siccatum and succinylsulphathiazolum.

People and Paint

AN interesting departure from the meticulously documental findings of the paint chemist on the why and how of paint behaviour is the consumers' view—what they like in paints and why they like it. The domestic paint user is a stern critic; that is evident in the 81-page survey, "People and Paint," just issued by the Paints Division of I.C.I., Ltd. It represents a distillation of the opinions of over 2000 housewives from many parts of the United Kingdom on the wearing qualities or attractiveness, or the reverse, of the paint finish on selected items of domestic equipment and furniture. These domestic consumers were also asked to give their views on the interior decoration of their homes and the results leave no doubt that the users have very pronounced views, as important, perhaps, as any other data on which the oil and colour chemists have to work. A summary of the main findings shows that the most frequently mentioned fault concerns flaking and peeling of wash or distemper on walls and ceilings. Deterioration of the finish of household equipment is frequently attributed to hard wear. Traditional colours are mainly desired. Complaints by users concerning finish related chiefly to bicycles (62 per cent), lawn mowers and perambulators (51 per cent). Furniture finishes satisfy four out of five housewives.

WIDENING STUDENT EXCHANGES

(continued from page 692)

extended to 32. Fifty-eight sought chemical engineering experience in Sweden and 41 in the Netherlands. Of the 44 chemistry students from all countries, 27 came to this country, more than twice as many as any other participant received.

In Great Britain more than 130 industrial organisations, among which chemicals, metals and scientific instruments were fully represented, volunteered to be employers and instructors, and the thoroughness with which they performed their rôle has received a warm testimony in many student reports. That benevolence is fortunately not peculiar to this country; the cordiality of their reception in the workshops and by the people overseas has been recorded in warm terms by British students. Their frequent lack of a working knowledge of the language of their hosts was characteristically considered no impediment. The preference for speaking English appears to be as widespread as ever it was. That exchanges such as this, in any language, are still eagerly sought should be a subject for profound thankfulness.

Simplifying Recording

ADVANCED modern equipment for the efficient running of business or facilitating the administration of works or laboratories has had its widest showing at the Business Efficiency Exhibition at Olympia, London, which closes today (Saturday).

Official visits were paid this week by representatives of the office appliance trades in Belgium, France, the Netherlands and Switzerland. Attendance generally has been higher and average exports throughout the industry are stated to have been three times larger than in the first year after the war.

Among the exhibits lending themselves to use in documentation was the Hollerith punch-card equipment demonstrated by the British Tabulating Machine Co., Ltd. These machines, besides being used for statistical purposes such as pay, costs, etc., are being increasingly employed for coding in libraries, for the documentation of scientific papers, and at Cambridge University in connection with the records of crystallography findings.

Another instrument for recording technical extracts, documents, or photographs, the Admel reprostat unit makes positive and negative photo prints on a range of emulsion-coated photographic materials by reflex copying. This requires neither lens nor camera.

LORD McGOWAN ON INCENTIVES

Success of Piece Rates in I.C.I.

"WHAT we need is not a wage structure guaranteeing a certain standard of living, but a wage policy of incentives and sanctions which will encourage the industrious and penalise the lazy. It is for that reason that I should like to see the increasing use, in every industry where it is possible, of work measurement and piece rates as a method of wage payment, a development which incidentally has already successfully gone some distance in my own company."

Lord McGowan, chairman of Imperial Chemical Industries, Ltd., said this at Birmingham Town Hall, on November 10, at the opening meeting of the winter series of Free Enterprise talks organised by the National Union of Manufacturers to which he contributed an outspoken review of recent industrial and national affairs.

Another vexed question is that of hours of work (said Lord McGowan). I think I am stating a fact when I say it is now widely agreed that the effort to shorten the standard working week, compared with the pre-war level, was a mistake; do not forget that with the reduction in the hours of the working week, wages were not reduced.

The true solution to my mind is not to increase production by working longer hours, but to obtain greater production from existing hours of work by greater effort. That there is room for this I have no doubt.

Waning Enthusiasm

One of the consequences of over-full employment and the breaking down of incentives to hard work, partly as a result of our vast burden of taxation, is an obvious lessening of effort. It shows itself in slower rates of working, in absenteeism, in unofficial strikes, in obstruction to new and more economic methods of working, in the creation of unnecessary jobs among operatives working as a team, in unpunctuality, in innumerable rest pauses or breaks for one reason or another, and in many similar ways.

In our straitened circumstances industry can no longer afford to employ the work-shy, the habitual absentee and the incompetent. They must be weeded out and it is contrary to the national interest that they should continue to be protected by the trade unions representing them.

I have confidence in our trade unions. I believe that they will succeed in re-establishing the control over their members which they seem to have lost. But we should deceive ourselves if we thought that they will have an easy task. It is a supremely difficult and delicate one, calling for strength of character, skill and tact. It behoves us, as industrialists, to show an understanding of their problems and to help them and our workers in any way we can.

Vital Co-operation

On the subject of the relationship between management and labour, Lord McGowan said it was essential, in his opinion, that management should get closer to the workers and explain to them far more of what is involved in regard to the problems that beset their particular industry, and the country. That was an example of human relations, which were all-important, and on which confidence for the future largely depended.

Turning to some other points upon which, he said, there had in recent times been shed more heat than light, Lord McGowan dealt with the Government's twin policies on prices affected by devaluation. In his speech in the devaluation debate, the Chancellor of the Exchequer suggested that there were no grounds for manufacturers raising their prices because their raw materials now cost more, until such time as their stocks of raw materials, purchased before devaluation, had been used up. Almost immediately after, however, the Ministry of Supply increased the prices of the metals with which it deals.

On the issue of nationalisation, Lord McGowan said he remained unrepentant. Whatever might be said in favour of nationalising services in the nature of public utilties, it was, in his view, fatal for the State to take over manufacturing industries, especially where they had overseas connections.

What is to be gained by nationalising efficient private industries such as cement and sugar, two at present under threat? Nothing could be gained by this policy, and it could produce disaster to our economic life.

One plea of the Prime Minister (continued Lord McGowan) was that the level of efficiency in the less efficient firms should be raised closer to that of the best.

I do not hesitate to suggest that the success and efficiency of the better firms are in no small measure due to their expenditure on research, and I would make a plea for greater research in industry. Moreover, I would throw out the suggestion in passing that those firms which draw some part of their personnel from the universities might well give some financial assistance to them by the creation of university fellowships or in some other way.

Empire—the Solution

Lifting our eyes for a moment from the domestic scene, in which direction shall we seek the way to a lasting solution of our problem, especially since we see no evidence on the part of America to reduce their tariffs? With tariffs as they are, how can we be expected to compete with the mass production which prevails to such a large extent in the United States? . . . .

Surely what we must aim for is a renewed drive to make the most of the Empire's resources and her people's skill. Our system of tariff preferences within the Empire has been directed precisely to this end—the more intensive development of available natural and human possibilities. Outside hostility to these preferences is, I think, profoundly misguided; they have played a vital part in promoting stability and steady progress within the Empire, from which the rest of the world has reaped considerable benefits.

We have to admit, however, that our special ties with the Empire are not in themselves enough. We have now in addition to concert measures in common with our immediate neighbours in Western Europe. The pre-war problems of these ancient states, including Great Britain, have been brought to a pitch of crisis as a result of the second world war. But while it has become evident that common action and unity of purpose within Western Europe is an absolute necessity, we have to recognise that the road is a stony one indeed.

National economies, which have evolved under varying conditions over hundreds of years, cannot overnight be welded into one. But let me say here that the major difficulty is not in fact the inherent clash between Great Britain's existing Commonwealth commitments, and her newly assumed rôle as a full partner in Western Europe. Britain is not the only European country which has such connections. Moreover, on a moment's reflection, it is abundantly clear that a united Western Europe will be all the stronger for including these countries, France, Holland, and others, as well as ourselves, who bring something more than their metropolitan resources into the union.

Ability to Survive

If what I have said suggests a spirit of pessimism I would wish to remove that impression. I am an optimist as regards our ability to survive the present crisis if we face up to our problems, serious and diverse as they are. We have immense reserves of character which have seen us through in the past, but simply to rely on this historic fact, and our past traditions, will not suffice.

If we are to survive there must be a new spirit inculcated in the minds of our people to ensure that every ounce of effort, both brawn and brain, of which we are each capable, is expended in the solution of our economic and financial difficulties.

Anglo-Belgian Collaboration on Plastics

A LONG-TERM agreement has been made by Solvay & Company, of Brussels, and Imperial Chemical Industries, Ltd., to promote the manufacture and development of polyvinyl chloride in Belgium and certain other European countries.

A new company, Solvic S.A., has been formed by the Belgian company and I.C.I. to manufacture vinyl chloride, PVC and its primary derivatives, including latex, pastes, and extrusion and moulding compounds, announced I.C.I. in London last week. Vinyl chloride monomer and polymer plants, using I.C.I. processes, have been built on a part of the Solvay Works site at Jemeppe-sur-Sambre. Polymer will probably be on sale towards the end of this year and extension of production is planned.

All I.C.I.'s patents and knowledge in this field will be available, and the English company will in the initial stages give service to customers and encourage the development of new uses.

Solvay & Co. will provide the raw material, chlorine, and has released experienced staff and trained workers to form a nucleus for the new company.

The director of Solvic S.A. is M. Léon Flamache, who has been general research manager of Solvay & Company for many years.

THE ASPATRON

Conflicting Views on Simplified Irradiation

THE possibility of producing artificially radioactive material, such as radioactive isotopes, by means greatly simpler than any now in use was discussed in connection with a demonstration at the A.S.P. Chemical Company, Gerrards Cross, last week, of a new apparatus, the Aspatron.

The inventor, Mr. Robert Barker, physicist of the A.S.P. company, told THE CHEMICAL AGE and other representatives who had been invited to see the Aspatron he believed it to be capable of producing short-life radioactive isotopes without recourse to any other apparatus.

The outstanding characteristic of the Aspatron, contrasting with all other atomic energy assemblies, is its extreme simplicity. It resembles a large tea-urn and its mechanical make-up is almost as simple: primarily an outer canister of high purity burnished copper, within which is an inner lining, also of highly refined copper. Water, as a moderator, is contained between the two, within a wall space of about 2 in.

Uranium Oxide

Ten circular trays, each pierced in the centre, are placed on top of each other in the water-jacketed vessel, leaving a central funnel of about 2in. diameter. This space accommodates a boron-steel "arrestor rod" which maintains the "pile" in a state of quiescence; in operation, a capsule containing material to be irradiated is placed in the tube.

The trays are filled and arranged to hold alternately paraffin wax, serving as a moderator, and uranium oxide. It had not yet been decided, Mr. Barker said, whether the arrangement of one deep tray and one shallow tray alternately was the most effective. It might, for example, create a greater concentration of neutron flux density if the trays were arranged in a sequence of two deep trays and one shallow one.

The Aspatron is primarily intended for use as a source of neutrons in localities where orthodox piles or cyclotrons are not available, it was explained in a statement by the company last week. Such use could enable small quantities of short-life radioactive isotopes to be prepared in equipment relatively inexpensive and sufficiently small and light to be readily transportable.

Mr. Robert Barker demonstrates the arrangement within the Aspatron of the alternating series of trays containing, in operation, uranium oxide and paraffin wax, to act as a partial barrier material

It could prove valuable for use in the radio-therapy departments of hospitals situated at a considerable distance from sources of radioactive isotopes whose useful life is so short that air transport is necessary. The provision on the spot of such material for use in biological and other research institutions would also be made possible. Small quantities of radioactive isotopes might be prepared in equipment weighing in the neighbourhood of 1 cwt.

In the orthodox design of pile, in addition to a high neutron density, there is a considerable amount of gamma radiation which contributes nothing to the efficiency of the chain reaction and is therefore useless from the point of view of the utilisation of atomic energy. The work done at Gerrards Cross, states the company, has been directed towards using gamma radiation to good effect.

It is known that certain elements respond more readily to this so-called "photo-disintegration" than do others. The particular element employed in the Aspatron has a relatively high gamma-neutron cross-section and a disintegration threshold-energy apparently slightly lower than the theoretical value. The Aspatron makes effective use of the gamma-neutron exchange process, thus considerably enhancing the efficiency.

Normal sources of neutrons (fissionable nuclei) are also present. Useless capture of neutrons by the copper employed in the assembly itself is guarded against by adopting a critical "thinness" in construction. The Aspatron's full load of uranium oxide is approximately 35 lb. and the estimated price at which the apparatus can be produced is suggested to be £250. The first to be exported is intended for Gambia, said the company's chairman.

Official Comment

The Ministry of Supply, Atomic Energy Research Establishment, Harwell, was represented at the Gerrards Cross demonstration, and an opinion by the director, Sir John Cockcroft, on the possibility of producing radioactive isotopes in useful quantities "by novel methods" was later circulated by the Ministry.

"At Harwell," states Sir John Cockcroft, "apart from production in accelerating machines such as the cyclotron, isotopes have been produced in the two piles in very considerable numbers and with a useful concentration of activity for both medical and industrial use.

"To achieve this concentration it is necessary to have available a large flux of neutrons. In the smaller pile at Harwell this is 100,000 million per sq. in. per second. In the large pile the flux is a hundred times larger.

"In spite of these enormous fluxes, a greater concentration of neutrons is desirable for many purposes, and fluxes lower by more than a small factor have failed to produce isotopes of any practical use.

"Calculations and measurements have been made over the last 10 years at the Department of Scientific and Industrial Research and elsewhere on structures using small amounts of uranium. It is well known in scientific circles that the numbers of neutrons obtained in such structures have been some million times less than the number obtained in the small pile at Harwell.

"For this reason neither in Britain nor in any other country has such a method been used for isotope production for practice use."

Britain's Sixth Atomic Centre

A FURTHER addition, making a total of six, to the atomic energy establishments in the United Kingdom was anticipated in a statement this week from the Ministry of Supply. The official account, which omits to state to what department of atomic energy research the new establishment will be devoted, says that the site is at Capenhurst (near Little Sutton), Chester, where the Ministry already has a storage depot. It would be necessary to acquire an additional 150 acres, the Ministry foresees, and while this would necessitate the employment of agricultural land, the special geographical requirements of such a centre made that unavoidable.

The new establishment would be comparatively near the existing ones at Riseley and Springfield. Work on the site is to begin next year and will employ several thousand.

Estimates suggested this week in the Liverpool area indicate that some 3000 constructional workers will be needed and it is recalled that Cheshire County Council has in hand a "priority scheme" to erect 500 houses on a 70-acre site at Little Sutton.

Atomic Power in Five Years?

THE possibility that a small reactor for the production of power for industry may be operating within four or five years was foreshadowed by Dr. C. J. Mackenzie, president of Canada's National Research Council, speaking recently in Winnipeg to the Manitoba Chamber of Mines. That depended upon certain technical difficulties being overcome. "There is no indication that atomic power will become generally competitive with ordinary central power plants for many, many years," he added. Meanwhile, in Canada, the use of atomic energy for peaceful purposes was making progress in the face of "hampering restrictions of secrecy."

Outlining the progress of research at the atomic energy plant at Chalk River, Ontario—the only plant in the Western Hemisphere in which heavy water, instead of graphite, is used to slow the atomic chain reaction, Dr. Mackenzie recalled that the director of reactor projects for the U.S. Atomic Energy Commission had described the Chalk River reactor as the "world's most advanced." The experimental pile offered research facilities unrivalled at the moment anywhere. Petroleum chemistry was a beneficiary.

U.S. CELLOPHANE

A Third Producer Licensed

COINCIDING with the announcement that the suit by the Anti-Trust Division of the U.S. Department of Justice, charging E. I. Du Pont de Nemours & Co. with monopolistic practices in the making and selling of Cellophane, is scheduled for trial next year (THE CHEMICAL AGE, *61*, 471), it is reported that the Du Pont Company, in an attempt to expand U.S. production of Cellophane, has licensed Olin Industries, Inc., East Alton, Illinois, to manufacture the product. This is the outcome of more than a year's effort by Du Pont to find a firm willing and able to invest the large amount of capital, estimated at a minimum of $20 million, necessary to enter the field on an economically efficient basis.

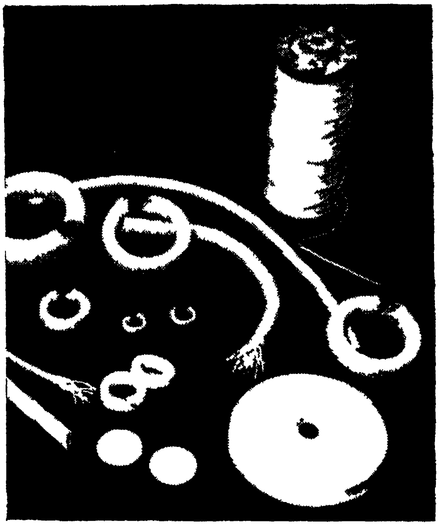
Under the terms of the contract Du Pont agrees to licence Olin Industries under all its Cellophane patents; furnish full technical information and methods of production; assist in the selection of a plant site; design and build an eight-machine plant with an estimated capacity of approximately 33 million lb. of Cellophane a year; help train personnel; and assist in putting the plant into commercial operation. Olin Industries will pay a fixed fee for design and construction of the plant and will also pay Du Pont for licences and technical information.

The entrance of Olin Industries into the cellophane manufacturing business is stated to be a logical expansion of the company's operation into a field in which it already has had wide experience and has conducted intensive research. There will now be three U.S. producers of the film, the third being the American Viscose Company, which recently announced a considerable expansion of its capacity.

THERMOPLASTIC PACKING

Resistant Forms for Chemical Plant

PROMISING export orders are stated to be coming in for a new type of plastic gland packing, for the oil refining, chemical. and food industries. Fabricated from a new thermo-plastic material of marked physical strength, the packings are almost entirely inert to solvent and corrosive attack by oils, chemicals and gases in regular use in industry. The only corrosive substance found to have an effect, a minor effect, was hydrofluoric acid.



[Courtesy of Crane Packing, Ltd , Slough.

The packings are suitable for use in temperatures up to 450° F. The are resistant to deformation, which is valuable in preventing extruding into the clearances used in general engineering; and their texture confers lubricating properties.

Plastic Piping for Farm Irrigation

PLANS are under discussion between the Scottish Council (Development and Industry) and Mr. Roy Newton, an Australian engineer and chairman of Die Casters, Ltd., of Melbourne, for the production in Scotland of equipment for the latter's system of land irrigation. The council has taken a six months' option on the scheme, which involves the irrigation of land by plastic conduits 1 ft. underground.

Work is already being done in Australia on the project, for which machinery and equipment worth £50,000 has been shipped from Britain. The Scottish Council has been active in recent years in developing the agricultural equipment and machinery industries in Scotland and has taken particular interest in irrigation systems.

Coinciding with this news is the report that the first installation of Alkathene plastic anti-corrosion piping to be laid in Scotland has just been installed at Cupar, Fife, on Rumgally Farm. The piping, made by I.C.I. Ltd., is extremely light. Almost as flexible as rubber, it is claimed to stand severe frost and will not readily corrode.

Basic Chemicals in August and September

Production and Consumption Levels Advance

A SUBSTANTIAL increase in production and use in the U.K. of sulphuric acid and consumption of contributory materials is among the trends shown in official records of movements in key chemicals and some metals in August and September. The enlarged production and supply of acid finds parallels in several other departments of chemical production, when compared with the corresponding period of 1948.

Estimated numbers employed in all sections of the chemical and allied trades in August were once again marked by a slight increase over the totals for the previous month. Distribution of workers (in thousands) was as follows: coke ovens, chemicals and dyes, explosives, etc., 251.7 (184.2 men, 67.5 women); paints and varnishes 38.1 (26.8 men, 11.3 women); oils, greases, glue, etc., 65.7 (52.3 men, 13.4 women); pharmaceutical, toilet preparations, etc., 82.8 (41.3 men, 41.5 women).

These figures and the table given below are abstracted from the latest issue of the *Monthly Digest of Statistics*, No.46, October (HMSO, 2s. 6d.).

	August, 1949 Thousand Tons			August, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	139.1*	129.0	—	122.4*	119.0	—
Sulphur	—	26.2*	91.5*	—	21.3*	82.6*
Pyrites	—	17.6*	76.0*	—	16.5*	59.0*
Spent oxide	—	14.6*	173.8*	—	16.1*	161.3*
Molasses (cane and beet)	7.8	29.4†	251.2	6.8	28.2†	175.2
Industrial alcohol (mil. bulk gal.)	2.13	2.26	4.26	1.92	1.88	8.81
Superphosphate	16.0	13.9	—	15.7	15.9	—
Compound fertilisers	138.4	112.5	—	135.8	96.4	—
Liming materials	—	429.0	—	—	319.2	—
Ammonia	—	6.46*	6.49	—	6.58*	5.60
Nitrogen content of nitrogenous fertilisers	21.54	19.19	—	20.48	18.50	—
Phosphate rock	—	82.9	245.7	—	77.9	166.1
Virgin aluminium	2.57	13.8	—	2.37	13.5	—
Virgin copper	—	28.1	149.9	—	26.4	115.1
Virgin zinc	—	15.8	75.7	—	15.7	61.3
Refined lead	—	17.4	65.2	—	14.9	26.0
Tin	—	1.74	21.9	—	1.69	17.2
Zinc concentrates	—	11.4	54.0	—	13.7	41.0
Magnesium	0.28	0.31	—	0.35	0.35	—
Pig iron	185.0*	—	500.0*	181.0*	—	278.0*
Steel ingots and castings (including alloys)	306.0*	—	1,320.0	297.0*	—	986.0
Rubber: Reclaimed	0.41	0.43	2.89	0.46	0.47	3.84
Natural (including latex)	—	3.40	42.3	—	3.50	57.2
Synthetic	—	0.07	1.59	—	0.04	1.91

* September. † Distilling.

Standardised Commercial Vitamin D_3

THE acute wartime shortage of fish-liver oils to enrich poultry mash made it necessary for alternative products to be made available.

The increasing output of vitamin D_3 concentrates made by the irradiation of recrystallised 7-dehydrocholesterol was one factor which eased the position. Use overseas of vitamin D_3 in oil as a supplement to mashes supplying vitamin A in the form of the vegetable pro-vitamin has, however, influenced the British Standards Institution in preparing specifications to revise the formulation of oil mixtures for animal feed.

Interest in vitamin D_3 solutions was increasing in Britain and would, it was felt, undoubtedly lead to the marketing of a variety of products made up with various diluent oils, and containing amounts of vitamin D that might well be different for every manufacturer. Some measure of standardisation before that happened seemed to be desirable. It was, therefore, decided to prepare standards for two solutions of different concentration.

The standard provides minimum limits for vitamin potency and maximum acidity, as well as methods of test. It can be obtained from the British Standards Institution, 24 Victoria Street, S.W.1, price 2s., post paid.

POLYMERISATION INHIBITORS

Characteristics of Some Newer Anti-Oxidants

TO prevent the premature polymerisation of monomeric substances and also to arrest or regulate the polymerisation process itself, the chemist has developed a considerable number of inhibitors and so-called polymer regulators. The best known inhibitors are hydroquinone, catechol and pyragallol, the first being most suitable for use with methyl methacrylate.

Other common inhibitors are pyridine, benzoic acid, phenol, resorcinol, benzyl alcohol, ethylamine and benzylamine. There are also some metals, particularly copper and certain inorganic compounds, used to retard polymerisation; the most important is copper acetate.

Where hydroquinone and other well known inhibitors are unsuitable, use is being made of some of the newer anti-oxidants. Of particular interest is 2,5-di-tertiary butyl hydroquinone. This is a white crystalline substance having a melting point of 210-212°C. It is insoluble in water but soluble to the extent of 28 g./100 g. in acetones: 26 g./100 g. in alcohol and 1.5 g./100 g. in benzene. It is a good polymerisation inhibitor for vinyl acetate, styrene and other vinyl-type monomers.

Unlike some other inhibitors this para di-hydric phenol does not interfere with the polymerisation of these monomers at elevated temperatures in the presence of a catalyst. Thus it need not be removed as is required in the use of other stabilisers. In addition to its use as a retardant of polymerisation processes, it is also useful as a stabiliser against ultra-violet deterioration of rubber and synthetic elastomers.

Another hydroquinone derivative of interest as an anti-oxidant, is hydroquinone mono methyl ether. This also is a white crystalline compound and its melting point is 53-54°C., boiling point 243°C. It is slightly soluble in water, 4 g./100 g. solution, readily soluble in acetone, 81 g./100 g.: alcohol 82 g./100 g.: benezene 11 g./100 g. and ethyl acetate 71 g./100 g. solution. This ether is readily soluble in most fats and oils and may be used to prevent rancidity of oleaginous products.

The light yellow crystalline compound, N-N-disecondary butyl *p*-phenylene-diamine, is a powerful anti-oxidant and, because of its solubility in a number of solvents and oils, it is very suitable for use in synthetic elastomers. The compound has a melting point 10°C. (it supercools readily and crystallises with difficulty even at −20° C.); boiling point is 315°C. and specific gravity 25°/20°C. is 0.9360. Another useful anti-oxidant, N-n butyl *p*-aminophenol is also a light yellow compound with a separation temperature of −15° C. It is usually sold as 48 per cent in isopropanol.

Some of the compounds employed as inhibitors are also useful as polymerisation regulators, *e.g.*, hydroquinone, phenol and dodecyl phenol. Probably the best known regulators or arresters are dodecyl mercaptan and di-isopropyl xanthogendisulphide. *p*-benzoquinone is one of the newer regulators; it has a melting point 113-115°C. and, because of the unusual number of conjugated double-bond systems in the molecule, it is a very reactive chemical.

High Resistance of U.S. Fluorine Plastic

A NEW plastic material, Fluorothene, which may facilitate some experiments because it cannot be dissolved by any known solvent, most acids and caustic soda at ordinary temperatures is now being manufactured for the United States Atomic Energy Commission by the Carbide and Carbon Chemicals Corporation at Oak Ridge, Tennessee. The material is based on the compound chlorotrifluoroethylene and is one of the fluorine plastics associated with the atom bomb project. An obvious application of the plastic is in making filters which are chemically resistant to almost all reagents.

While some solvents may swell Fluorothene, extended immersion tests with 125 chemicals at 158°F. failed to dissolve it, and this inertness, coupled with good mechanical strength and comparative ease of fabrication, has enabled research workers to use it in certain operations which previously had been impossible.

Inert filters have been made by flame-spraying finely divided Fluorothene on a suitable base to give a porous, multi-layer coating. Porous filter discs up to 16-in. diameter and 0.5-in. thick have been prepared. They resist acids and most organic solvents and are not wettable by water. They are, as yet, costly and somewhat difficult to fabricate.

PHENOLIC RIVAL OF ACTIVATED CARBON

New Resin's High Adsorption Capacity

From A CORRESPONDENT

ACTIVITY and versatility substantially higher than is encountered in conventional material of its kind is being attributed to a new type of phenolic resin, designed principally as an adsorbent. It was developed in California by the Chemical Process Company.

The new resin, in granular form, possesses a high adsorbent capacity for organic colour bodies and, after exhaustion, its adsorption activity can be repeatedly restored with dilute alkaline solution without diminution of capacity. The resin has no ion-exchange properties in the usual sense and, in general, will not produce any change in *p*H. It is somewhat more effective in acid than in alkaline solutions but it is physically inert to acids, alkalis and all common solvents.

Adsorption operations with this resin can be carried out in several ways, the most usual being column or bed type percolation, slurry or batch-type application, with subsequent separation by hydraulic, centrifugal or filter-press methods, or in closed "basket" or bag containers immersed in the solution to be heated.

Unlike activated carbon, this adsorbent is clean and easy to handle; the particles are tough, resilient and readily withstand abrasion in upflow operations and slurry or batch-type applications. The resin is stable over a wide range of *p*H and temperature values.

Types of colour which have been effectively adsorbed include caramel bodies, melanoidin compounds, polyphenols or tannins and food-processing dyestuffs. Liquors successfully decolorised include beet, cane and corn sugar solutions in various stages of refinement, protein hydrolysates, pineapple mill juice, canning syrups, crude aqueous glycerine and a number of solutions of edible dyes.

Tests were carried out to diminish the intense brown colour resulting from the "browning" or melanoidin reaction produced by warming a solution containing monosodium glutamate and dextrose. On passing this solution through a bed of the adsorbent resin, 85-90 per cent of the brown colour was removed. A caramel colour produced by heating sucrose to 200°C. was removed as to 80-90 per cent by percolating the caramel solution through a bed of the granular resin.

At *p*H values ranging from 0-14 and temperatures up to 90°F. the resin has been found to be effective. Strong oxidising agents, high *p*H (caustic alkalinity), high dissolved oxygen and high temperatures are liable to have a harmful collective effect on the resin, but, generally speaking, it is said to be capable of giving good results even under difficult conditions of use. Adsorption efficiency has, however, been shown to be largely dependent on viscosity, the best results being obtained with a water-like viscosity.

It is claimed as a result of American experience with this resin that, in terms of Brix, satisfactory adsorption appears to take place at 10 to 15° Brix (at room temperature) and will progressively decrease to less than half as much adsorption activity at about 30° Brix. The decline is nearly linear.

Apart from the obvious use for the removal of colour bodies from aqueous solutions of organic compounds, the resin also promises to be of interest, in some instances, for separating closely related molecules having slightly different degrees of polarity.

Ex-I.G.F. Men Tour Latin America

REPORTS from Buenos Aires state that three representatives of German chemical firms which belonged formerly to the I. G. Farbenindustries, including Mr. Wallot, formerly a director in the Central Financial Administration of the I.G., have recently arrived in Argentina, after having visited Brazil. It is reported that they intend to tour other Latin American countries to investigate the possibilities of establishing new foreign representation of their firms.

The interests of the I. G. in Argentina were taken over by the Government shortly before the defeat of Germany. The German parent companies of the firms concerned do not intend to renew the old representation agreements but it is said that they prefer to appoint private firms.

It is reported that, to avoid the impression that these I.G.F. members are forming a delegation, they arrived in the Argentine capital separately on three consecutive days.

LACQUER SOLVENTS IN THE U.S.A.

Phenomenal Growth of Nitrocellulose Uses

RECENT experience with lacquer solvents in the U.S.A. was discussed by Mr. R. F. Buller, guest speaker from New York, at the last meeting of the London Section of the Oil and Colour Chemists' Association. Mr. L. O. Kekwick (chairman of the section) presided.

Mr. Buller showed that the production of protective and decorative coatings, comprising paints, oleo-resinous varnishes, synthetic enamels and lacquers, now constituted a business with an annual sales value of over one billion dollars. The present dollar sales value of the industry, therefore, was approximately one-fifth of that of the steel industry.

He defined lacquers as any type of surface coating which produced a dry film through the medium of solvent evaporation, as contrasted with paints, varnishes and synthetic enamels which required the polymerisation or oxidation of their solid constituents to yield a dry film, and said that they represented more than 10 per cent of the annual sales value of the entire protective coating industry. The bulk of the lacquers produced employed nitrocellulose as the film-former.

Interest was growing in the use of other types of lacquers for special applications which utilised vinyl resins, ethyl cellulose, acrylic resins or cellulose acetate butyrate as the film-forming base. During the next decade considerable expansion in the production of those lacquers was expected. There was a growing demand.

The growth of the nitrocellulose lacquer industry had been phenomenal. In 1919 the production of nitrocellulose lacquers, including thinners, was about 2½ million gal.; in 1929 the figure was 45 million gal.; in 1937 it was 58 million gal., and it had risen to more than 80 million gal. in 1948.

Synthetic Enamels

That remarkable growth had taken place in spite of the development of alkyd resin based synthetic baking enamels, which had made their appearance about 1930. Although synthetic enamels had replaced nitrocellulose lacquers to a considerable extent in certain uses, the continual growth in the usage of nitrocellulose lacquers was due largely to improvement of their quality and to the development of new applications.

Improvement in the quality of nitrocellulose lacquers (and of other types of surface coatings) was due to a fundamental change which had occurred within the entire surface coating industry during the early 1920's. The industry was then in process of changing from an art to a science. Few chemists were employed in the surface coating industry in the early 1920's; by 1948, 41 out of every 1000 industrial chemists were employed on surface coatings. Approximately half those chemists were engaged in research. In only three industries were chemists employed in larger numbers—industrial chemicals, petroleum refining and drugs and pharmaceuticals. The rubber, plastics and food industries each required fewer.

Lustre and Durability

The use of alkyd vehicles in lacquers as plasticisers had improved lustre retention and had increased the solids content; lacquers were now considered to be on a par with synthetic enamels in respect of lustre and durability.

One of the newest developments was the so-called metalli-chrome finish patented by Du Pont in 1946. That finish was a pigmented lacquer characterised by great durability, rich colour and good translucency which provided a glamorous range of motor vehicle finishes in greys, greens and browns.

Nitrocellulose finishes could be formulated to provide coatings with almost any desired property. Their outstanding feature was that, with proper selection of ingredients, rapid or very slow drying lacquers could be prepared. Moreover, nitrocellulose finishes might be coloured with almost any pigment or dye to produce a wide variety of sheens. A wide range of gloss, viscosity, humidity resistance and durability was possible.

It was estimated in the U.S.A. that the automobile market consumed about 20 per cent of nitrocellulose lacquers and thinners, while wood furniture required about 10 per cent.

The coating of paper with nitrocellulose lacquers had many ramifications; and, in addition to their decorative features, the paper lacquers provided crease resistance. Low viscosity nitrocellulose, such as quarter-second or lower, was used in those lacquers to prevent curling of the paper during drying; resins, if used, were the plasticising type alkyds or dammar. Solvents employed were chiefly the low-boiling ketones or esters. Castor oil, dibutyl phthalate or dioctyl phthalate were the principal plasticisers used. Low cost was an essential requirement.

At present, the nitrocellulose lacquer manufacturer had available for use an unusual variety of raw materials, but for most applications the use of certain specific raw materials predominated. For example, among the important resins used in lacquers were non-drying and drying type alkyds; both were of the glycerol phthalate type. The non-drying alkyds were usually modified with the fatty acids of coconut, castor or cottonseed oil, while the drying type alkyds were generally modified with either linseed, soya or dehydrated castor oil.

The Popular Plasticisers

As plasticisers, castor oil, dibutyl phthalate and dioctyl phthalate were popular. So-called plasticising alkyds were employed extensively where extreme flexibility was required, such as in the preparation of leather finishes, paper lacquers, textile coatings and aluminium foil coatings.

Many types of diluents were used, but principally aliphatic naphthas, aromatic petroleum diluents with an aromatic content ranging from 35 to 80 per cent, and aromatic diluents such as toluene and xylene.

A particularly extensive variety of chemical solvents was available for the nitrocellulose lacquer manufacturers. More than 40 different alcohols and active solvents suitable for nitrocellulose lacquers were produced in quantities sufficient to be available for purchase in tank car lots.

An example of the sort of fundamental solvent data which provided useful information for the lacquer manufacturer, in the formulation of lacquer thinners the excess tolerance of a given series of thinners for toluene would usually indicate which thinner could be prepared most economically.

All might be equally efficient as thinners for a given lacquer and produce films of similar appearance, but they might vary in excess tolerance for toluene by values ranging from 0.7 to 1.3. Obviously, if the thinner with the excess tolerance of 0.7 were quite satisfactory, the thinner with an excess tolerance value of 1.3 probably had an unnecessary excess solvency.

In the formulation of a high solids lacquer, fundamental data on the solids concentrations attainable at a practical working viscosity with different solvent compositions would reveal the composition providing optimum solvency. For example, after the lacquer manufacturer had decided what ratio of resin to nitrocellulose he wished to use to obtain the desired film properties, the comparative solvency of various active solvent blends was determined.

Most active solvents exhibit their maximum solvent power in the presence of approximately 25 per cent latent solvent. Moreover, the type of diluent or its concentration up to 20-25 per cent did not affect solvency appreciably. For diluent concentrations beyond 20-25 per cent, the solvency of the system would decrease more rapidly with the aliphatic naphtha type diluent than it would with aromatic diluents such as toluene.

For a given active solvent a suitable economic solvent system providing high solvent power would have approximately the composition—active solvent, 60-55 per cent by volume; latent solvent, 20 per cent, and diluent, 20-25 per cent.

In the course of the discussion which followed the presentation of the paper, Mr. N. F. Sarsfield asked if there was an economic factor which decided from which source the diluents were obtained.

Mr. Buller agreed that there was. The aliphatic naphtha materials he had mentioned had very low aromatic content; the range might be 5-15 per cent. They contained an aromatic material having a long aliphatic side chain connected to an aromatic group; so that the solvency of such material was not so great as that of benzene or xylene.

Production of Esters

Replying to Mr. W. F. Daggett, the speaker said that quite a few companies used ketones and esters; no one company was concerned exclusively with one type of practice. But the total production of esters was considerably greater than that of ketones and it was reasonable to assume that the overall usage of esters would be the greater.

Asked by Mr. M. Ball about the use of hot lacquers, Mr. Buller said they appeared not to be used very largely, but he believed their use was growing. One of the drawbacks to their use had been the problem of keeping the lacquers at constant temperature while spraying, and at the same time avoiding any effect of the lacquers on the gaskets, and so forth, used in the pumps for circulating the lacquers. One manufacturer had recently developed special equipment for that purpose and was having some success with hot lacquers.

INTERNATIONAL MINING ENTERPRISE

Franco-German Niobium Development

A SIGNIFICANT development in Franco-German post-war economic relations has recently taken place in Baden in the French zone of Germany, where the Diet has passed a bill authorising the Land Government to participate to the extent of Dm.70,000 in the Niob-Berghau G.m.b.H., Kaiserstuhl. The object is stated to be the exploitation of niobium containing minerals in Baden, which, with the exception of the Norwegian occurrences, are believed to be the only European deposits worth working on a commercial scale

Niobium—which is playing an increasingly important rôle in radio and radar techniques– is on the Inter-Allied list of items which may not be manufactured in Germany. It appears, therefore, that the formation of the Niob-Bergbau G.m.b.H. is a method of circumventing this ban.

The proposed new company is to be financed to 70 per cent by the Government of Baden and to 30 per cent by a French concern, the Fabriques de Produits Chimiques de Tham et Mulhouse, S.A., and the company's board is to comprise three representatives of Baden and two of the French concern. It is also proposed to set up an arbitration tribunal, to be staffed by Swiss members, to settle any points of dispute between the contracting parties.

The company expects an influx of foreign exchange amounting to as much as Dm.300,000 within its first year of operations, to be utilised for commodity purchases in France.

It is proposed that the Niob-Bergbau G.m.b.H. shall mine the niobium-containing material and burn it to get rid of carbon in the form of carbon dioxide; the burnt material is then to be transported to the Alsace works of the French concern, where the niobium will be extracted.

French Potash Prospects

NEW methods, using American mining equipment and technique, for the fuller exploitation of the potassium mines at Alsace are being employed by the Mines Dominiales de Potasse d'Alsace. It is hoped that the net output, at present 6-8 tons per day, will be doubled, while labour costs, which account for about 45 per cent of the cost price, will be decreased.

Plans for greater production have been under consideration since 1946 and it has been found that modern mechanical equipment is essential if the desired increase is to be achieved.

Experts are now studying problems of modification in lighting and ventilation, dimensions of supports and chambers in the galleries 500-700 metres below the surface where the two layers of sylvinite lie.

Iron Activity in Venezuela

PREPARATORY to undertaking commercial iron-ore mining, the Iron Mines of Venezuela, at El Pao, is continuing to construct installations, including a standard gauge railroad, representing an eventual investment of approximately $50 million. Output during the first full year of operation is expected to reach 2 million tons. The railroad, from Palua on the Orinoco River, to the mine pit, about 50 kilometres, is expected to be operating in December.

The Oliver Iron Mining Company, an American firm, which holds a large iron-ore concession in the vicinity of Ciudad Bolivar, has started a survey to determine whether it would be more economical to transport ore by railroad to the sea coast than to ship it down the Orinoco River.

At the present time, the whole of the State of Bolivar and the federal territory of Delta Amacuro, comprising the most promising area of iron-ore deposits in Venezuela, have been declared by the Government reserved for exploration and exploitation of iron ore.

Mexican Sulphur Deposits

UNDER a contract made with the National Commission for Stimulation of the Mining Industry, a department of Mexico's Ministry of National Economy, the Cia. Exploradora del Istmo, S.A., will undertake experimental exploitation of vast sulphur deposits on the Isthmus of Tehuantepec, which may eventually free Mexico of dependence on imports for her sulphur needs. The deposits were discovered during drilling operations for oil.

Under the terms of the contract, the company must give the commission a royalty on sulphur obtained. Mexico now imports about 3000 tons of sulphur annually.

PREPARING MICRO-SPECIMENS

U.S. Advance in Precise Microtomy

From A SPECIAL CORRESPONDENT

A NEW method of ultra-microtomy, developed recently by S. B. Newman, Emil Borysko and Max Swerdlow, of the U.S. National Bureau of Standards, now provides an inexpensive, practical means of preparing very thin sections of biological tissue for study with either the light or electron microscope (Fig. 1).

Work is now in progress at the National Bureau of Standards to apply the new method to the study of the structure of natural and artificial fibres found in leather, paper and textiles.

In the new procedure, *n*-butyl methacrylate is polymerised around the specimen to produce an optically clear embedding medium having highly desirable cutting properties. A smooth, continuous advance of the specimen towards the knife of a slightly modified conventional microtome is then obtained from the thermal expansion of a metal specimen holder. Thus, sections of tissue having uniform thickness of fractions of a micron over a large area and undistorted structure may be cut one at a time.

The need in many research fields for an efficient method of producing uniform thin sections of tissue has been apparent for several years. The application of the electron microscope to many biological problems has in fact been hampered by the lack of such a method Because of the very slight penetrating power of the electron beam in commercial instruments and the great relative depth of field involved, specimen structure is difficult to interpret when sections are over a fraction of a micron in thickness. At the same time, techniques available for preparing thin sections have been elaborate and difficult, producing few usable sections.

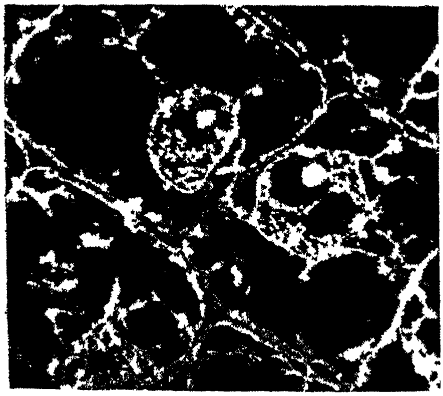


Fig. 1. Reproduction of an electron micrograph of an extremely thin cross-section of onion root tip in the zone of elongation. (Magnification × 3750)

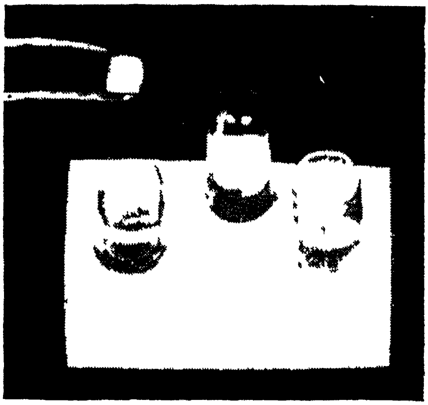


Fig. 2. Specimen tissue being placed in the gelatin capsules in which they are embedded in a monomer to which a polymeriser has been added

The most recent modification before this was that of Pease and Baker, who used a modified Spencer rotary microtome and reduced the unit specimen advance to approximately 1/10 the calibrated value. The microtome was then reported to produce sections as thin as 0.1 micron from tissue embedded in paraffin and collodion. Many workers, however, have found it difficult to use this technique.

The U.S. National Bureau of Standards sought to develop a rapid, efficient sectioning procedure which could be carried out in routine fashion by an operator without a great deal of special training. The resulting method, which goes far in accomplishing this objective, should be of decided advantage in those fields of biology, medicine, agriculture, and industrial technology that are concerned with the microstructure of plant and animal material.

An important feature of the new method is an easily made, inexpensive device which holds the embedded specimen and advances it gradually and uniformly towards the knife of the microtome. This device may be employed without drastically modifying the conventional microtome. It is essentially a brass block in which a hole is threaded at one end to receive a standard ⅜-in. brass pipe plug A cavity drilled in the face of the plug provides a seat for the embedded specimen.

Behind the plug is a needle valve, which admits compressed carbon dioxide gas to the interior of the block. As the gas undergoes a large increase in volume, it cools and contracts the assembly. Stopping or reducing the flow of carbon dioxide allows the apparatus to approach room temperature and thus the thermal expansion provides continuous advance of the embedded tissue towards the cutting edge.

Effective mounting of specimens is essential. The tissues are fixed, then dehydrated in an ethyl alcohol series by the usual cytological techniques. From absolute alcohol they are transferred to a solution containing equal parts of absolute alcohol and monomeric *n*-butyl methacrylate. After about one hour in the alcohol-monomer mixture, the tissue is put in the monomer alone for an equal period. To ensure removal of the alcohol it is then placed in two additional changes of monomer for at least one hour in each before embedding in the polymer.

Gelatin capsules serve as convenient embedding moulds (Fig. 2). The main body of the capsule is set upright in a wooden block or other base and filled with the monomer, to which has been added 1 per cent (by weight) of a polymerisation catalyst (2,4-dichlorobenzoyl peroxide). After the tissue is placed in the mixture, the lid of the capsule is slipped on to retard evaporation. The assembled capsules are then suspended by strips of cellophane tape in an oven held at a temperature of 45° to 50°C.

After six or eight hours' heating, the monomer is polymerised into a solid matrix containing the tissue embedded at the bottom of the clear plastic. Several hours more at this temperature will ensure complete cure. The gelatin capsule may then be removed by soaking in water.

The embedded specimen is cemented into the mounting block with a mixture of pure gum rubber and paraffin. Then, with the thermal-expansion device clamped in the jaws of the microtome head, the entire assembly is cooled below room temperature (Fig. 3). Upon the appearance of a thin layer of frost on the metal, the

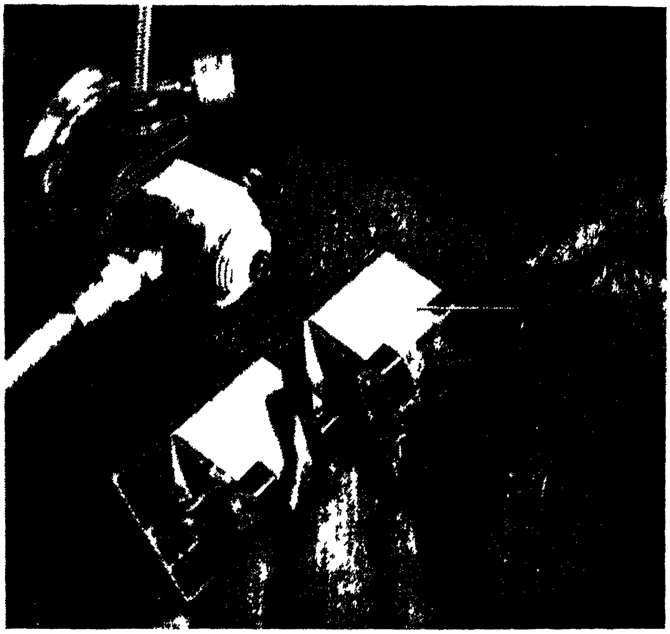


Fig. 3. Embedded tissue is shown mounted before the knife of a conventional microtome in the specimen-holding device. Thermal expansion of the specimen-holder, after it is cooled by compressed carbon dioxide gas, gradually and uniformly advances the specimen towards the knife

knife is adjusted just short of contacting the specimen on the cutting stroke. The specimen is then mechanically advanced at 2- or 3-micron increments until the first slice is made.

At this point the mechanical advancing mechanism of the microtome is disengaged and the gas flow reduced or stopped. The specimen then advances because of the thermal expansion of the metal holder. Some control of the rate of specimen advance can be obtained by bleeding the carbon dioxide at various reduced rates into the expansion chamber.

Although polybutyl methacrylate has excellent cutting properties, the cut sections usually are found to be somewhat folded. They are lifted from the knife by a dry camel's hair brush, picked up with a dissecting needle, and placed on a water surface warmed on a hot plate to about 35°C. After a period, ranging from a few minutes to an hour or more, many will flatten out on the surface. Those sections which are thin enough to show bright interference colours are then floated on to clean microscope slides and allowed to dry flat.

In preparing material for the electron microscope, the sections are floated from the water on to clean glass slides and dried flat. The matrix is then dissolved by placing the slide in acetone, toluene, or amyl acetate. A dilute solution of collodion in amyl acetate is allowed to flow over the slide bearing the tissue, which is then permitted to dry at room temperature. The collodion film is floated from the slide on to water, and electron-microscope specimen screens are placed over the areas of the film containing the sections. The entire film is then floated from the plate to a larger volume of water, and the freely floating film, to which the specimen screens adhere, is removed from the water by flipping it over and out with a strip of short-fibred paper or a glass microscope slide.

Although the new method for obtaining very thin sections has given excellent results, it possesses certain limitations. The greatest chance for failure appears to lie in the polymerisation of the embedding mass. However, use of low-temperature catalysts and maintenance of a curing temperature of 45° to 50°C. will minimise such difficulties. Occasionally tissues are injured during the polymerisation reaction, but such tissues are easily detectable and can be promptly discarded.

On the whole, the new method makes possible the production of a high percentage of usable sections which have uniform thickness over a large area, and integrity of tissue structure.

Expressing Residual Values of Fertilisers

A CHANGE in existing methods of expressing residual values has been recommended by the Scottish Standing Committee for the Calculation of the Residual Values of Fertilisers and Feeding Stuffs in its report, now published by the Department of Agriculture for Scotland (HMSO, 6d.).

The suggestion of the committee was that residual values should be calculated by multiplying the percentages of nitrogen, phosphoric acid and/or potash in the original fertiliser by appropriate prices per unit (*i.e.*, per 1 per cent of a ton) of N, P_2O_5 or K_2O and making appropriate adjustments.

Values per unit of nitrogen, phosphoric acid and potash were recommended as follows: nitrogen 10s.; phosphoric acid 5s.: potash 5s.

The value of residues of plant food in the original manure after one, two, or three growing seasons was calculated to be as follows: Nitrogen (a) in inorganic manures, dried blood and dried poultry manure nil; (b) in other organic manures 5s. after one season; 2s. 6d. two seasons; nil, three seasons. Phosphoric acid 2s. 6d.; 1s. 3d.; 7½d. Potash 2s. 6d.; 1s. 3d.; and nil after one, two, and three seasons respectively.

Liming of land called for special attention, the committee considering that the present methods of assessing the residual value tended to underestimate the cumulative effects on fertility of applying moderate dressing at frequent intervals. The evidence was that small applications at frequent intervals were more beneficial than the application of the same total quantity of lime at infrequent intervals.

The effects of lime varied so much that any attempt to give a figure for the whole country would be abitrary. The committee therefore recommended that a deduction of one-seventh of the net cost of liming (including delivery and spreading) should be made for each growing season since application.

MATERIALS FOR GERMAN CHEMISTRY

Wide Category Freed from Import Restriction

LISTS of commodities admitted into the German Federal Republic freely without quantitative restrictions, in accordance with the OEEC decisions, have been published by the West German Minister of Economic Affairs. They account for 69 per cent of all raw material imports. Among commodities of chemical interest included, are crude drugs and many other raw materials for the pharmaceutical industry, rosins, copals, gums, essential oils and raw materials for the distillation of essential oils, vegetable dyes, glues, many vegetable oils for the paint trade, tartar, crude phosphates, phosphorite, coprolite, apatite, pyrolusite, crude glycerin and lye, crude iodine, phosphorus phosphorus sulphides, casein, lecithin, natural rubber, gutta-percha, synthetic rubber, asbestos, various non-ferrous minerals and metals, burnt pyrites, grey zinc oxide, tin oxide, stannic acid, and rare earths and their metals and alloys, except uranium and thorium.

The list does not contain any substance of chemical interest of which appreciable quantities are produced in Western Germany but is likely to be extended as so far as it covers only 36 per cent of the total import value. OEEC decisions provide for the removal of quantitative restrictions from at least 50 per cent of the total import trade of the participating countries.

Sodium Chemicals and Oil

Although chemical production in Western Germany has not been increasing substantially in recent months, the market tendency remains easy. The five soda factories are reported to be working at 60-65 per cent of capacity on an average. Attempts to increase exports have been only moderately successful. The demand for soda from soap manufacturers and cellulose industry is now on a lower level and consumers generally are reducing their stocks. Soda imports, contracted under JEIA auspices while the shortage lasted, are still continuing.

The Shell oil refinery in Hamburg, Germany's largest refining plant, was reopened early in November. When in full production, the refinery will have a daily throughput of 440,000 tons of crude. The changeover from Venezuelan crudes as refined before the war to Middle Eastern oil has necessitated extensions to the deparaffination installations. The reconstruction work still continues and is expected to require a total expenditure of about Dm.55 million by the end of 1930.

In a bid to limit the dismantling of the Fischer-Tropsch plants (THE CHEMICAL AGE, *61*, 607), Ruhr-Chemie A.G. has submitted a plan to the Federal Chancellor, Dr. Adenauer, suggesting that if the total synthesis capacity cannot be retained, at least half—sufficient for 185,000 tons of primary products annually—should be left untouched.

The company, which speaks for a number of interests, argues that the gas generation and the processing plants should not be dismantled at all as they meet essential economic requirements. Dismantling is said to have been suspended, in accordance with an agreement between the French authorities and the Rhine-Palatinate Government, at the works of Seifenfabrik Siegert & Co., of Neuwied, which covers the bulk of the soap consumption in that area.

Expanding Potash Totals

West German potash exports in 1949/50 are scheduled to reach 100,000 tons, valued at about $10 million, as compared with 57,000 tons in 1948/49 and 33,000 tons in 1947/48. This increase in export shipments goes hand in hand with an expansion of output—1,570,000 tons of crude salts in 1947 to 2.41 million tons in 1948 and 2.6 million tons in the first nine months of 1949.

By the end of this year, virtually all the extensions embarked upon in old potash works are to be completed. West German potash production will then run at an annual rate of 700,000 tons of K_2O, compared with 185,000 tons twelve months earier. A further increase in potash production will be impracticable until the Königshall-Hindenburg works of the Burbach Kaliwerke A.G., which were flooded in 1939, reach the productive stage, probably early next year. Operations here will add nearly 100,000 tons of K_2O annually to the West German potash output.

Chilean Nitrate Price Cut

Competition from synthetic nitrate has necessitated a price reduction of Chilean nitrate by the equivalent of U.S.$3 per ton.

Developing Paint Manufacture in South Africa

Widely Increased Capacity and Variety

From OUR CAPE TOWN CORRESPONDENT

THE extremely widespread increase in South African capacity for producing paints and other surface coatings is one of the most prominent characteristics in recent industrial affairs.

A new firm of manufacturers of paint, varnish, enamel and distemper for decorative and industrial purposes recently commenced operations at East London with the policy of developing and making surface coatings particularly suited to local conditions. Because some raw materials are not yet available, a full range of its lines is not yet being manufactured, but the firm is stated to be capable of making almost every finish, except leather finishes and, for the time being, furniture lacquers.

* * *

Buffalo Paints, Ltd., Sydney Road, Durban, a firm closely associated with British Paints, Ltd., Newcastle-on-Tyne, plans to produce in its Durban factory the Torpedo brand of paint developed by the British company for marine use. Another line that will shortly be made in South Africa is Apexior boiler compound. The modern metal primer made in Durban has a zinc chromate base and is claimed to save up to 50 per cent of primer costs. It is also cheaper than red lead primers. Buffalo Paints, Ltd., has had the advantage of technical assistance from its British associate, which is stated to have improved the products and made possible the production of a wider range of paints in the Union.

* * *

A private company, the Emalux Manufacturing Co., P.O. Box 5281, Johannesburg, is being formed to make a glazed wall surfacing, which is to be offered as an alternative to tiles, wood panelling or paint, with a ten-year guarantee against wear. It is claimed to be resistant to the effects of oil, grease and fat, to be waterproof and easily cleaned. The company also intends to make paint for exterior protection of walls. At present it has factories in Johannesburg, Cape Town and Durban.

* * *

Elvic Products (Pty.), Ltd., 269 Point Road, Durban, is now producing a complete range of nitrocellulose lacquers and allied materials for use in car spraying and the furniture industries, including rubbing compounds, masking paste, clear lacquers, clear sealers, metal primers, synthetic lacquers and enamels, and enamel thinners.

* * *

Other paint manufacturing companies recently registered in the Union are Dimanol & Co. (Pty.), Ltd., paint and white lead manufacturers, Booysens, Station Road, Johannesburg, and Chemical Utilities (Pty.), Ltd., 34 Betty Street, Jeppe, Johannesburg, makers of cellulose nitrate lacquers for wood and metal paints.

* * *

Silicon Chemicals, Ltd., is using its new Klipfontein factory for the production of organo-silicon compounds and such chemicals not previously made in the Union as ferric chloride and chloroform. In association with Rely Paint & Metal Works, Ltd., it is planned to produce fireproof paints and building preservatives. The company is also to supply media for heat transfer and silica preparations regularly used in such industries as plastics, rubber and textiles.

* * *

The production of explosives in the Union reached the record monthly total of 198,000 cases, or 5000 tons, during August, and extensions to the existing chemical and explosives plant, which it is hoped will be completed in 1952, are planned to raise its annual output of ammonium nitrate to 26,000 tons.

* * *

Fireworks are now being made in a factory near Cape Town. In recognition of the shortage of English fireworks, caused by import control, maximum production has been maintained. The factory could, however, have disposed of much more than its present output and it has been necessary to ration supplies to wholesalers. In spite of import restrictions and the lack of certain chemicals, the factory has produced more than £20,000 worth of goods for the home and export markets.

• PERSONAL •

ROYAL SOCIETY MEDALLISTS

Left: Prof. R. A. Peters, F.R.S. (Royal Medal). Right: Prof. A. R. Todd, F.R.S. (Davy Medal)

PROF. HUGH BRYAN NISBET has been appointed principal of the Heriot-Watt College, Edinburgh, in succession to Principal J. Cameron Smail who is due to retire in March next year. The professor, who is 47, was demonstrator and later lecturer in chemistry at the college, and in 1946 succeeded the late Prof. T. Slater Price in the chair of chemistry. He served as a member of the Chemistry Advisory Board and of the committee to report on the training of fuel technologists set up by the DSIR. His researches have ranged from the study of local anæsthetics, anti-malarial and bactericidal drugs, to studies on motor spirits of high octane numbers.

The personal library of the late DR. J. COLVIN, senior lecturer in inorganic and physical chemistry at Leeds University, is being presented to the university chemical department as the nucleus of the library equipment of a room, to serve as a memorial to him, which is to be set aside as a common room for students. A Colvin Memorial Fund is also being opened, which it is hoped may provide sufficient endowment to buy additional books every year.

MR. GILBERT WAY, planning manager at Fort Dunlop, has been appointed chief planner for the Fort Dunlop group of factories in succession to MR. A. T ROBERTSON who has undertaken the post of works director of Dunlop South Africa, Ltd. MR. W. J. BARTON, of the production planning department at the Fort, has been promoted its planning manager in succession to Mr. Way.

The British Road Tar Association announces that COLONEL H. C. SMITH, deputy chairman of the Gas Council, has been re-elected president of the association for the third year in succession. MR. G. A. HEBDEN, director and general manager of the South Yorkshire Chemical Works, Ltd. (coke oven interests) and MR. STANLEY ROBINSON, chairman and managing director of the Midland Tar Distillers, Ltd., were re elected vice-presidents, and MR. W. K. HUTCHISON, chairman of the South Eastern Gas Board, was re-elected the hon. treasurer. The chairman of the managing council is MR. J. DAVIDSON PRATT (Association of British Chemical Manufacturers).

Part of the University of Liverpool's new physics laboratory at Mount Pleasant, which will be used eventually for nuclear physical research, has been completed. DR. J. ROTBLAT, in the absence of PROF. H. W. B. SKINNER professor of physics, performed the opening ceremony. The first section of the laboratories will be used for administrative purposes until the premises are opened next year after the erection of a 1500-ton cyclotron. Prof. Skinner, who is deputy scientific officer at Harwell atomic energy establishment, is engaged on part-time duties at the university. He is to move permanently to Liverpool in the New Year.

MR. G. A. S. NAIRN, chairman of Lever Bros. (Port Sunlight), Ltd., has been elected chairman of the board of governors of Liverpool Collegiate School.

(*continued overleaf*)

PERSONAL

(*continued from previous page*)

M. Léon Flamache, director of the newly established Anglo-Belgian plastics undertaking, the formation of which by I.C.I., Ltd., and the Solvay company is announced on page. 696

Pandit Nehru, India's Prime Minister, has had a private meeting with **Lord McGowan**, chairman of Imperial Chemical Industries, Ltd. They are understood to have discussed the development of fertiliser production in India.

Dr. O. H. Mavor (James Bridie) will be the chairman and will propose the toast of "The Profession of Chemistry" at the Ramsay chemical dinner to be held in Glasgow on December 2.

Dr. John Long, of Imperial Chemical Industries, Ltd., has been adopted by the Hartlepools Liberal Association as prospective candidate.

Obituary

A NOTE from the Textile Institute recalls that the recent death of **Mr. George Moores**, F.T.I., Wilmslow, Cheshire, at the age of 87, severs one of the few remaining links with the foundation of the Textile Institute 40 years ago. With the late Mr. J. H. Lester, of Manchester, Mr. Moores was jointly responsible for the beginning of the movement which led to the founding of the institute in 1910, with 150 members. He was the institute's first general secretary and remained in office from 1910 to 1914.

The death has occurred of **Mr. Arthur Jenner Chapman**, F.R.I.C., analytical and consulting chemist, at his home at Chalfont St. Giles, Bucks. He was 76 and had retired some 15 years ago. Mr. Chapman was a member of the Radium Lodge of Freemasons.

PARLIAMENTARY TOPICS

Steel Bill Postponed

THE certainty that the Iron and Steel Bill will not be put into effect until after the next Parliamentary Election was assured by a Government amendment in the House on Wednesday. The effect of this was to postpone the appointment of members of the Iron and Steel Corporation until October 1, 1950. That agrees, in its effect, with the House of Lords proposal that the Bill should not operate until that date. The Government has proposed as the vesting date January 1, 1951.

REPLYING to questions from Mr. J. Lewis regarding imports of carbon black and its production in this country, the President of the Board of Trade (Mr. Harold Wilson) stated in a written answer that in the first six months of this year 14,279 tons of carbon black from natural gas and 2498 tons of other blacks had been imported at a value of just over £1 million. Production of carbon black had already begun in one factory in this country and two others were in process of construction. On completion of the three plants it was hoped that their total output would supply about half this country's requirements.

SATISFACTION with the progress of exploratory work in connection with Yorkshire potash was expressed by the President of the Board of Trade in a written answer to Mr. E. G. Willis. The Minister stated that he did not consider any special steps regarding potash were necessary at present.

QUESTIONED by Sir Patrick Hannon about the ECA technical assistance programme, Mr. Herbert Morrison stated that the supply of foreign technical publications had recently been authorised by the U.S. authority and the first batch was now being obtained.

Interpreting Research Results

WITH the object of facilitating the application to industry of successful developments of scientific research, the British Welding Research Association has recently appointed a team of development and liaison engineers to interpret the association's research results. **Mr. A. J. Hipperson**, who leads the team, was for many years with the welding advisory service and has been with the BWRA since its inception. His staff includes **Mr. R. G. Burt**, **Mr. C. C. Bates**, and **Mr. P. M. Teanby**, who was a member of the association's research staff.

Technical Publications

USEFUL data concerning the properties, temperature coefficient, thermal conductivity and mechanical properties of electrical resistance alloys are given in a new brochure "Red Fox Electrical Resistance Alloys" (S.F.243), issued by Samuel Fox & Co., Ltd., Sheffield, on behalf of the United Steel Companies, Ltd. The brochure also covers fundamentals of electrical heating, winding of helical coils, temperature conversion tables, etc., and is handsomely produced and illustrated.

* * *

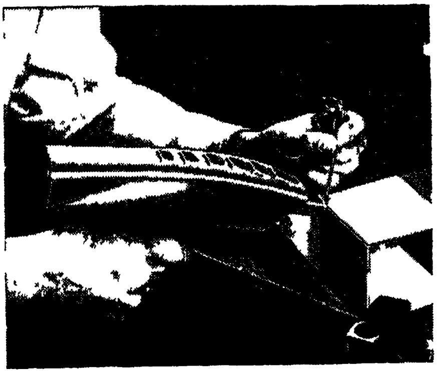
INDUSTRIAL chemistry has so many aspects that a classified list of chemicals and their manufacturers is continually required. A work which helps to supply the need is the revised edition of the "Chemical Manufacturers' Directory," 1949, now available. The directory, which has been published uninterruptedly for 81 years, covers England, Wales and Scotland, some firms in Ireland and also lists the chemical brokers and agents in London. The price is 5s. 6d., post paid 6s., Simpkin Marshall (1941), Ltd.

* * *

THE techniques of construction and operation of the electron microscope and its use in the testing of materials, is the subject of a new manual just released by the Office of Technical Services of the U.S. Department of Commerce. The manual, prepared to assist in the training of U.S. Air Force technicians, is a basic introduction to the nature of the electron microscope, and its contribution to various types of materials problems. In addition to a theoretical discussion of the problem of image resolution, it provides practical information on the construction and operation of the instrument, and the preparation of replicas and specimens. The 48-page report also contains a number of photomicrographs as well as graphs and illustrations. Copies of the manual (No. PB-97957), "The Electron Microscope and Its Application to Materials Problems," ($1.25 each), may be obtained from the U.S. Department of Commerce.

* * *

LIGHTNESS consistent with required strength is essential for portable tools and machine tools used in mobile workshops. The advantages of the strength/weight ratio of aluminium are pointed out in "The Aluminium Courier," published by The Aluminium Development Association.



[Courtesy, Mullard Electronic Products, Ltd

This ultrasonic soldering iron (type E7587) developed in the Mullard Electronic research laboratories consists essentially of a removable copper soldering bit and a magneto-striction transducer. By temporarily destroying the oxide film and providing a clean surface, ultrasonic stimulation facilitates the soldering of aluminium and other metals which form refractory oxides

THE necessity for the measurement of illumination as distinct from its estimation has greatly increased in recent years, and new technique has involved the use of a number of unfamiliar terms. Some of the more important of these photometric terms have been listed for information by Everett Edgecumbe & Co., Ltd., London, in its latest catalogue sheet (471/4908). Portable dynamometer wattmeters, both precision and industrial models, are described and illustrated.

* * *

INFRA-RED heating for the drying or treatment of powdered chemicals, and in a wide range of applications both for thermosetting and thermoplastics materials in the plastics industry are described in a new booklet "Infra-red Heating" now available from The General Electric Co., Ltd., London. Among the processes described and illustrated are heating of thermoplastic sheet, gellation or fusing of plastic coated fabric, heating of PVC or PVC-coated fabrics prior to embossing, drying or pre-warming of thermoplastic powders and chips prior to extrusion, moulding and heating of thermosetting pellets, flake or powder prior to moulding.

Next Week's Events

TUESDAY, NOVEMBER 22

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. (With Chemical Engineering Group, SCI). N. Swindin: "Recent Developments in Submerged Combustion."

The Royal Institute of Chemistry

Welwyn Garden City: The Cherry Tree, 8 p.m. (With Welwyn Garden City Scientists' Club.) M. P. Balfe: "Leather: Its Constitution and Properties."

Hull Chemical and Engineering Society

Hull: Prof. Paul G. Espinasse: "The Evolution of Clockwork in Relation to its Social Background."

WEDNESDAY, NOVEMBER 23

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 6.15 p.m. (Microbiological Panel). E. B. Anderson and L. J. Meanwell: "Recent Work on the Bacteriology of Pasteurisation."

Institute of Physics

London: Royal Institution, Albemarle Street, W.1, 5 p.m. (With Royal Meteorological Society.) Dr. A. R. Meetham (Fuel Research Station, Greenwich): "Physics of Atmospheric Pollution."

Institute of Fuel

Chester: The Refectory, the Cathedral, 6.30 p.m. A. D. Cummings: "A History of Fuel Technology."

Manchester Literary and Philosophical Society (Chemical Section)

Manchester: Portico Library, Mosley Street, 5.45 p.m. J. K. Luke: "Plastics."

Society of Instrument Technology

Manchester: Reynolds Hall, College of Technology, 7.30 p.m. C. H. Gregory: "Control Rooms for Chemical and Oil Plants."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. J. C. Chaston (Johnson Matthey & Co., Ltd.): "Powder Metallurgy (other than carbides)."

Royal Statistical Society

Birmingham: Chamber of Commerce, New Street, 6.30 p.m. T. V. Matthew: "The Extension of Statistical Methods in Production Engineering."

Newcastle-on-Tyne: Chemical Industries Club, 18 Louvain Place, 6.30 p.m. Dr. B. P. Dudding: "The Presentation of Sampling Data as a Guide to Executive Action."

THURSDAY, NOVEMBER 24

The Royal Institute of Chemistry

Gillingham: Medway Technical College, Gardiner Street, 7.30 p.m. Brains Trust. "The Chemical Protection of Crops."

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. W. G. Grace: "Forensic Medicine."

Society of Visiting Scientists

London: 5 Old Burlington Street, W.1, 7.30 p.m. "Science in the Detection of Crime." Chairman: Prof. Sir Sydney Smith. Speakers: H. S. Holden, Keith Simpson and F. G. Tryhorn.

Society of Dyers and Colourists

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. (Junior Branch.) "Some Observations on the Dyeing and Finishing of Cellulose Acetate and Cellulose Acetate Mixture Fabrics.

FRIDAY, NOVEMBER 25

The Chemical Society

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5 p.m. (With RIC and SCI). Dr. U. R. Evans: "Corrosion Inhibitors."

Glasgow: University, 7.15 p.m. Sir John Lennard-Jones: "Modern Theories of Chemical Valency."

Newcastle-on-Tyne: King's College, 5 p.m. Reading of original papers.

Southampton: University College, 5 p.m. Prof. W. T. Astbury: "Macromolecular Studies with the Electron Microscope."

Institute of Metals

Sheffield: Mappin Hall. (With Electrodepositors' Technical Society.) A. T. Steer: "The Effect of Cold Working and the Influence of Surface Preparation on the Quality of Silver Deposition."

SATURDAY, NOVEMBER 26

Institution of Chemical Engineers

Birmingham: University, Edmund Street, 3 p.m. J. A. McWilliam: "Corrosion Resisting Steels for the Chemical Industry."

Acetic Anhydride Costs £9 More

Sterling devaluation is cited by British Industrial Solvents, Ltd., as the factor necessitating the increase, last week, in the price of acetic anhydride of £9 per ton.

◆ HOME ◆

B.O.C. Extending

The British Oxygen Co., Ltd., is erecting a new factory at Ystrad Road, Swansea.

Fuller Overseas Trade in October

United Kingdom exports for October were provisionally announced as £156.1 million, an increase of £14.1 million over the previous month, and only £3.9 million short of the March record. These figures were given by the President of the Board of Trade in London last week. Imports were provisionally stated to have been £198.2 million, an increase of £17.1 million above the September total.

Increased Coal Production

Britain's aggregate output of coal last week again showed an increase over the corresponding week of last year, although coal-mining manpower is now lower than it has been for more than two years. Comparative production figures are:—Last week: 4,467,700 tons (4,241,700 tons deep-mined, 226,000 tons opencast). Corresponding week of last year: 4,309,000 tons (4,103,700 tons deep-mined, 205,300 tons opencast).

Chemists Not Guilty

The Pharmaceutical Society of Great Britain has commented on a statement by the Bishop of Chelmsford in the Chelmsford Diocesan Chronicle referring to the use of automatic machines outside chemists' shops for the sale of contraceptives. The society observes that its disciplinary machinery is available to deal with any conduct of this kind by chemists and that, although there are more than 14,000 chemists shops, only one authenticated case in which a chemist has been involved has been brought to the Society's notice. Appropriate action was taken in that case.

Metal Controls Amended

By an order which came into force on November 15, the Minister of Supply has consolidated all previous control of non-ferrous metals (copper, lead and zinc) orders; freed from control the acquisition and disposal of copper and zinc scrap; and revoked the old statutory maximum prices of copper, lead and zinc. Licences will still be needed for scrap lead because the rationing scheme still operates, and for unwrought forms of the three metals. The prices at present in force are not changed, but the margin for copper rods and the extra charges for small lots are increased.

Alkali Workers' Memorial

A memorial plaque on stone was unveiled at the Castner Kellner alkali works, Weston Point, Runcorn, on November 11, to 31 men who lost their lives in the war.

More Free Imports

The provision of open general licences for the importation of arsenious oxide and white arsenic, rape seed oil, unmanufactured cotton waste and a variety of wool products, as from November 22, is announced by the Board of Trade. This implements the current scheme of multilateral relaxations of restrictions and relates only to the countries participating in the agreement.

Mersey Rubber Fire

The disastrous fire which broke out last week in a rubber warehouse in the Liverpool docks, was considered to be the largest single fire there had been in Dockland. All the goods in the wharehouse were due to go to New Zealand and Australia. The fire was still burning this week, when damage was estimated at over £2 million. Dr. J. B. Firth, director of the Home Office Forensic Science Laboratory at Preston, has been called in to investigate the cause of the fire.

Soap Makers' New Control

A controlling interest in the business of Peter Lunt, Ltd., soap manufacturers, Aintree, Liverpool, has been acquired by Griffiths Hughes, Ltd. Mr. J. H. Wootton-Davies, industrial chemist, who was a Government adviser on oils and fats during the first world war, remains chairman of the Lunt company. He has a long connection with the industry, as manager of several departments of the Lever Brothers group, before building up the present business of Peter Lunt to its present scope.

Census of Production

An order prescribing the matters about which persons may be required to furnish returns for the Census of Production to be taken in 1950, in relation to the year 1949, has been made by the Board of Trade to come into operation on December 31, 1949. The order exempts undertakings concerned with the production of coal, gas, electricity, oil shale, crude or refined petroleum or shale oil products from making returns of information they already supply to the Ministry of Fuel. The order is "The Census of Production (1950) (Returns and Exempted Persons) Order, 1949" (S.I. 1949, No. 2053) (1d.).

◆ OVERSEAS ◆

New W. German Oil Port

One of the largest projects attempted in Western Germany for a number of years is the expansion into a modern oil port of the Duisburg oil tank farm of the German-American Petroleum Co., Ltd., at Duisburg. The installations will cover about 90,000 sq. m. and will become Germany's second largest oil port after Hamburg.

Australian Rayon Plans

Courtaulds, Ltd., has announced that negotiations to establish the first units of a rayon industry in Australia are well advanced. It is intended to form a company with a nominal capital of £A10,000,000, which will build factories for the production of both viscose rayon yarn for tyres and other industrial purposes, and acetate rayon yarn for textile purposes.

Mining Progress in Malaya

Malayan tin ore production during January-June, 1948, amounted to 35,287 tons, and coal output for the same period reached 193,116 tons. Other branches of the mining industry have shown similar progress. Additional evidence of mining development in Malaya is apparent from the tin production figure, which showed a yield of 643 tons during June.

Pure Hydrocarbons from Italian Petroleum

Profs. V. Berti and G. Leidi state that they have succeeded in extracting pure methyl-cyclohexane and toluene from petroleum found in Italy. They used a cut of petrol obtained from Italian crude and separated it at a temperature ranging between 204° and 220°F. into paraffinic, naphthenic and aromatic fractions. A successive rectification yielded pure methyl-cyclohexane and toluene.

Potential £10 million for Manganese

At the African Regional Scientific Conference held in Johannesburg, Dr. T. J. W. Jorden, of the S. African Iron and Steel Corporation, criticised what he described as the " Union's suicidal policy of exporting its rather limited supplies of high grade manganese ore." Discussing the local use of raw material in the ferrous metallurgical industry, he said, " It has been estimated that conversion of this exported ore to ferro-manganese in the Union would have enhanced its value six-fold, and at present export rates would earn around £10 million in foreign exchange a year."

Rubber Surfacing of Roads

The feasibility of using rubber for road surfaces in Ceylon is engaging the attention of the Government. A comprehensive report on the subject is being considered prior to the experimental stage. Large scale use of powdered rubber is envisaged.

Indian Thorium Enterprise

The Government of India has signed a 15-year agreement with two French firms —the Banque Marocaine de Credit and the Société de Produits Chimiques des Torres Rares—permitting them to exploit and process the monazite sands occurring on the coast of Travancore State. The plant is to be staffed by Indians. who will be trained in France.

Norwegian Superphosphates

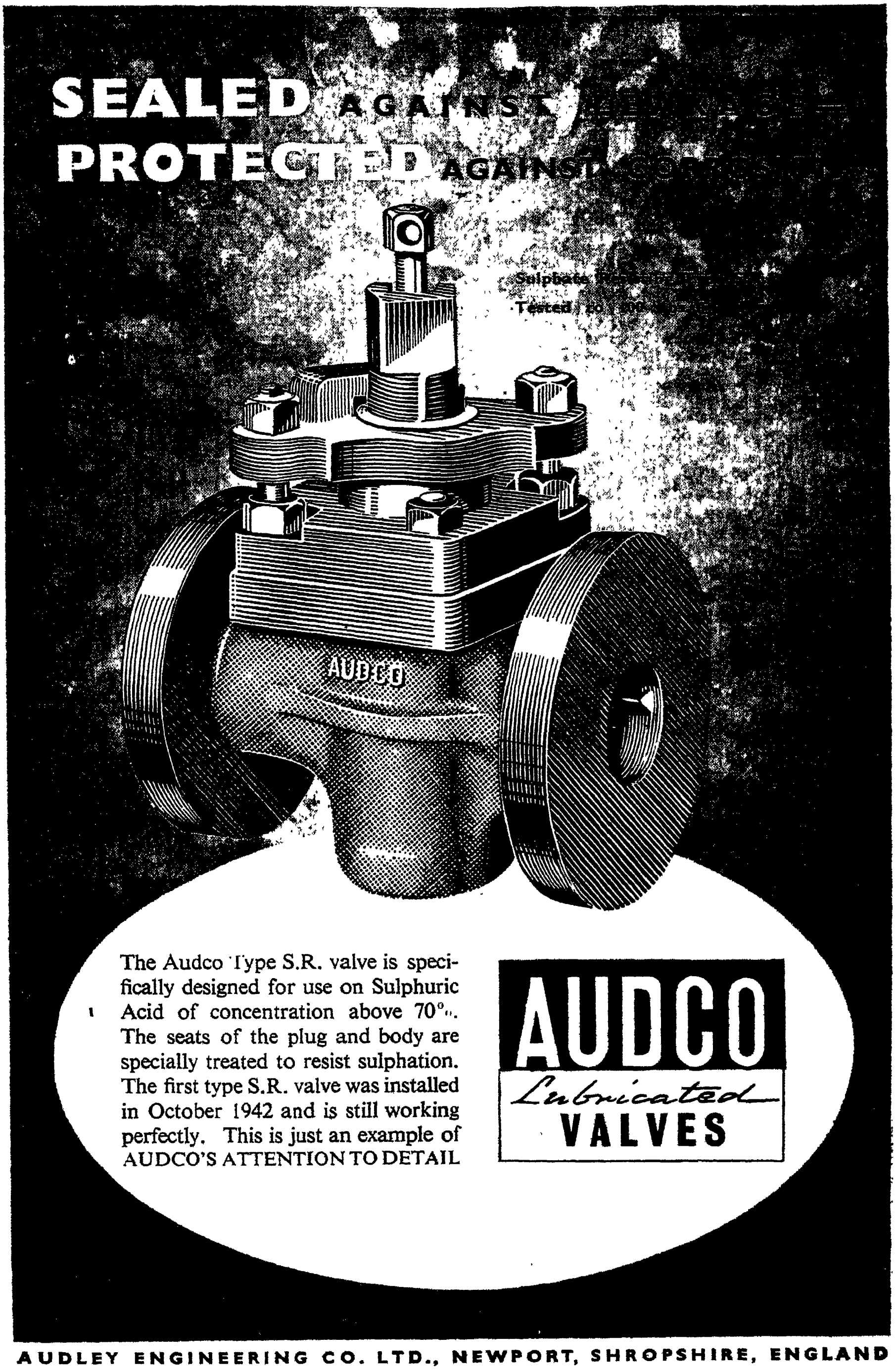
The Norwegian Zinc Company's superphosphates factory at Odda will begin production next week, first at the rate of 20,000 tons a year, increasing to 40,000 tons, and ultimately to 80,000 tons. This new factory, together with the Lysaker Chemical Factory which produces 35,000 tons, should supply over half Norway's annual demand for superphosphates—this year about 150,000 tons and about 170,000 tons in 1950.

British and U.S. Toolmaking

Addressing the annual convention of the National Tool and Die Manufacturers' Association in New York City, a British visitor, Mr. E. Slater, of Wakefield, said that British tool and die makers were more advanced than American tool shops in export sales and in making tools for deep stamping work. Despite lowered costs of tooling, however, British tools and dies will not compete economically against American shops. He cited the lack of standardised production in the British workshops.

Scientific Equipment via Unesco

A recommendation to the director general of UNESCO that the scheme to enable member countries to escape currency and customs duties in purchasing essential literature should be extended to scientific equipment and educational films was made at the fourth general conference of the international organisation in Paris last month. Good reports of the book coupon scheme were presented, which was stated to have been of real value to scientists and scholars during the past year.



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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Quickset Products, Ltd., London, S.E., manufacturing chemists (M., 19/11/49.) October 19, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on 55 Leroy Street, London. *Nil. October 14, 1948.

Solartron Laboratory Instruments, Ltd., Kingston-on-Thames. (M., 19/11/49.) October 25, £2000 debentures, part of a series already registered.

F. H. Steele & Co., Ltd., Dublin, manufacturing chemists. (M., 19/11/49.) October 17, £5000 debentures; charged on 22 Brookfield Avenue, Blackrock, Co. Dublin, also general charge. *Nil. March 17, 1949.

Satisfactions

Aeraspray Manufacturing Co., Ltd., Birmingham, spraying plant manufacturers. (M.S., 19/11/49.) Satisfaction October 21, of charge registered September 3, 1947.

Copper & Alloys, Ltd., West Bromwich. (M.S., 19/11/49) Satisfaction October 26, of mortgage registered December 17, 1947 (fully).

Peel Laboratories, Ltd., London, N., chemists, etc. (M.S., 19/11/49.) Satisfaction October 26, of debtors registered May 15, 1947, to the extent of £752 18s. 4d.

Receivership

Crest Laboratories, Ltd., 443 Bury New Road, Salford, 7. (R., 19/11/49.) Mr. Ronald F. Bendall, 31 Lloyd Street, Manchester, 2, ceased to act as receiver and manager on October 29.

Company News

Evans Medical Supplies, Ltd.

The directors of Evans Medical Supplies, Ltd., propose to increase the authorised capital of the company from £450,000 to £1 million and are to abrogate the participating rights of the 6 per cent preference stockholders. As compensation, it is intended to issue to preference stockholders 5s. of new ordinary stock for every £2 of preference stock now held. This will involve the capitalisation of £30,225 of reserves.

The increased authorised capital will comprise: £250,000 of £1 preference stock, £150,000 of £1 unclassified shares, £200,000 of 5s. ordinary stock, and £400,000 of 5s. unclassified shares. The directors will declare, on December 31, an interim dividend of 3 per cent on the ordinary stock.

Chemical Employment

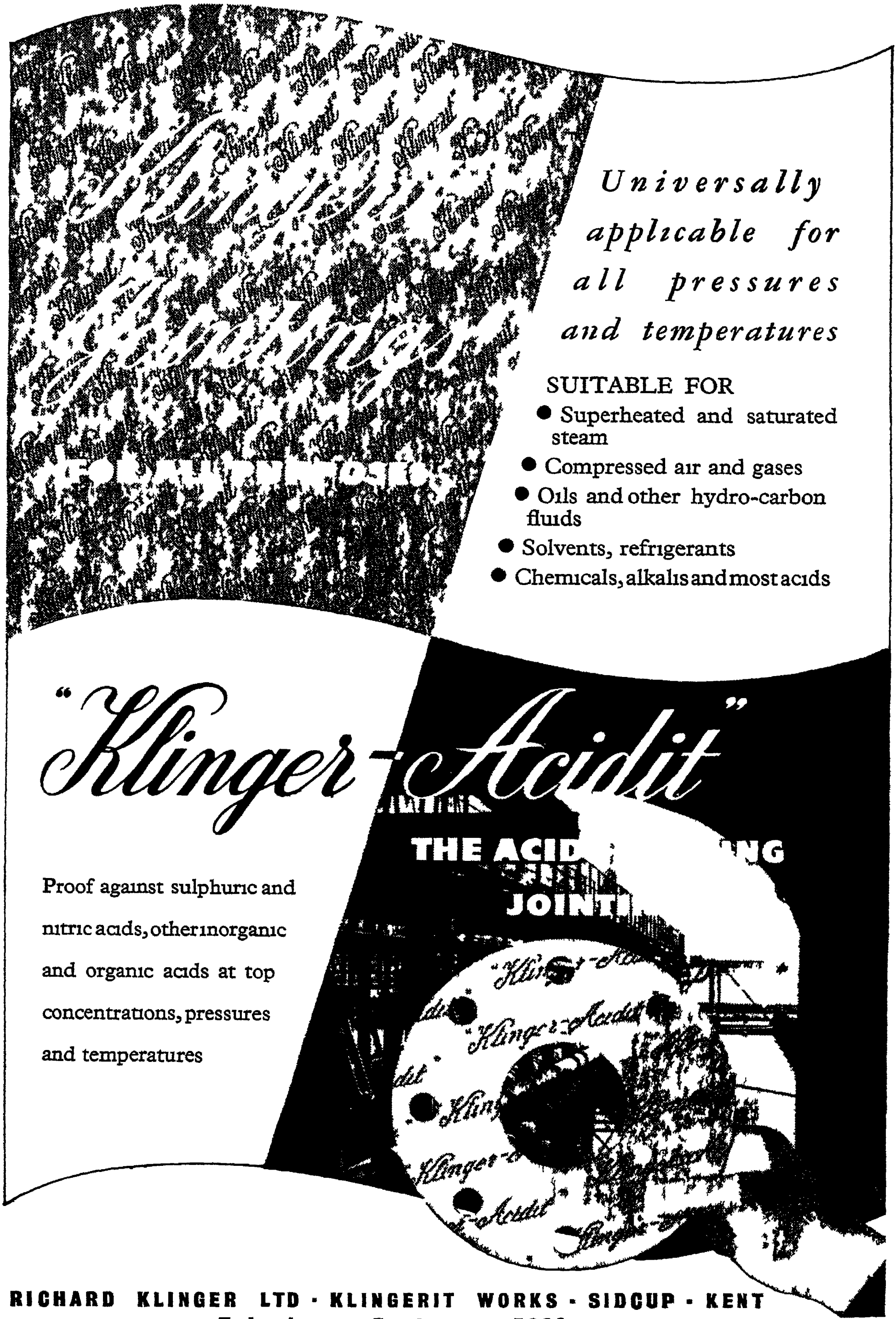
A FURTHER slight increase in the numbers employed in the chemical industry and allied trades in Great Britain in August is shown by statistics published in the October issue of the *Ministry of Labour Gazette*.

Figures, showing sectional distribution, are as follows:—

	Thousands		
	August, 1949	July, 1949	Mid 1948
Coke ovens and by-product works	17.6	17.6	17.3
Chemicals and dyes ...	197.9	196.5	195.5
Pharmaceutical preparations, etc.	33.8	33.6	30.8
Explosives and fireworks .	36.2	36.1	33.8
Paint and varnish ...	38.1	38.0	37.0
Soap, candles, glycerine, etc	49.0	48.7	46.9
Mineral oil. refining	35.4	34.8	30.7
Other oils, greases, glue, etc.	30.3	29.8	28.9
Total, chemical and allied trades	438.3	435.1	420.9

Canadian Acquisition

The recently formed subsidiary of the Standard Chemical Co., Ltd., Chemical Developments of Canada, Ltd., has acquired all the capital stock of Irwin Dyestuff Corp., Ltd., Montreal, the former subsidiary of Dominion Rubber Co., Ltd. Irwin Dyestuff Corp. is the distributor in Canada of the General Aniline & Film Corp.



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The Stock and Chemical Markets

STOCK markets have again been dominated by the trend in British Funds, which improved sharply on balance, the rally having been inspired by official support from the Government broker. The recovery has so far been held without further evidence of direct official support.

Rally in Gilt-edged helped other sections of markets, particularly leading industrials, but buyers continued to show considerable caution and chemical and allied shares generally moved narrowly. Imperial Chemicals, after being down to 41s. 9d., rallied to 42s. 3d. Monsanto 5s. ordinary eased to 50s., Albright & Wilson were steady at 30s., Boake Roberts 28s. and Brotherton 10s. shares 19s. 3d.

Elsewhere, Laport Chemicals 5s. units were 9s. 6d., but Amber Chemical fell to 4s. 3d. Bowman Chemical 4s. shares were 6s. 9d., F. W. Berk 13s. L. B. Holliday 4½ per cent preference were 20s. 3d., and British Chemicals & Biologicals 4 per cent preference 18s. 9d. Pest Control 5s. shares changed hands around 8s. 4½., Turner & Newall firmed up to 72s., and United Molasses were around 36s. 6d.

The 4s. units of the Distillers Co. have been active around 16s. 6d. "ex" the share bonus, while the new shares, which are £1 units (later to be "split" into 4s. units), were dealt in between 80s. and 83s. Firmness at 57s. 6d. was shown by Borax Consolidated. Dunlop Rubber improved to 61s.

British Glues & Chemicals 4s. units were 17s. Amalgamated Metal at 18s. were little changed following the reopening of the London Metal Exchange for the first free dealings in tin since the war. British Aluminium kept at 40s. There was less uncertainty in shares of companies connected with plastics, British Xylonite rallying to 53s. 9d., while Kleemann were 9s., De La Rue better at 21s. 3d. and British Industrial Plastics 2s. shares steady at 4s. 9d. Electric equipments firmed up, particularly G.E.C. at 72s. 6d.

The Government decision to postpone the take-over and vesting dates for nationalisation until after the General Election helped iron and steel shares. Hadfields rose to 26s. 6d., Dorman Long were 28s. 9d. (the results are imminent), with Colvilles at 32s. 6d. and Thomas & Baldwins 13s. 9d. United Steel rose to 27s. and Stewarts & Lloyds have been firm at 52s. 3d.

Boots Drug at 18s. 6d. moved in favour of holders, Beechams deferred were better at 14s. 1½d. with British Drug 5s. shares at 6s. 9d. Lever & Unilever at 41s. 6d. failed to hold an earlier rise. Fisons improved to 28s. Oil shares were uncertain, Anglo-Iranian changing hands slightly below £7, while Shell were 66s. 3d., but Burmah firmed up to 53s. 9d. and Trinidad Leaseholds were 25s. 1½d. on the full results. Further improvement in Apex (Trinidad) 5s. shares to 35s. 7½d. reflected hopes that the forthcoming dividend will be maintained.

Market Reports

ON the whole, trading on the industrial chemicals market continues fairly briskly with few important price changes to record. The movement to the home consuming industries is well maintained at recent levels and a fair amount of inquiry for shipment has been in circulation. Zinc oxide is reported to be 30s. per ton dearer and acetic anhydride prices have advanced by £9 per ton. A steady demand continues for most of the soda compounds and firmness characterises the position of the potash chemicals. Formaldehyde, hydrogen peroxide, bleaching powder and the barium compounds are other items in good request, while the non-ferrous metals are attracting a fair amount of attention. Some improvement in conditions is apparent on the coal tar products market and buying interest has increased for most items. There is a good outlet for cresylic acid at competitive rates and phenol is moving well.

MANCHESTER.—Prices are steady or firm in nearly all sections of the Manchester chemical market, although not much in the way of fresh movement has occurred during the past week. Home trade deliveries of most of the leading heavy chemicals, especially to the bleaching, dyeing and finishing sections of the cotton trade, have been on a good scale and a fair amount of fresh inquiry has been reported, with steady replacement buying. Export business has been around its recent levels. Among the tar products there has been a small improvement in cresylic acid and several other "dull" lines.

GLASGOW.—In the Scottish chemical market the supply position is fairly satisfactory, except in the case of Glauber salts (commercial and desiccated), which continue to be very scarce.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each Higher priced photostat copies are generally available.

Complete Specifications Accepted

Manufacture of fibrous glass combined with synthetic resinous material.—A. P. Thurston. (Owens-Corning Fibreglass Corporation). May 24, 1946. 630,190.

Manufacture of intermediates in the synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14 1945 630,076.

Processes for preparing pure alkali metal salts of penicillin and the product resulting therefrom.—Commercial Solvents Corporation. Sept. 4 1945. 630,254.

Beta-(heterocyclicthio)-carboxylic acids and method of preparing same.—B. F Goodrich Co. Oct. 5 1945. 630,081.

Refining of heavy hydrocarbons.—Anglo-Iranian Oil Co., Ltd., F. W. B. Porter, and J. W. Hyde. Sept. 6 1946. 630,204.

Production of d, l-methionine.—Merck & Co., Inc. Oct. 10 1945. 630,139.

Production of gelatine solutions and photographic emulsions of increased viscosity.—General Aniline & Film Corporation. Nov. 24 1945. 630,016.

Synthetic resins.—Mississippi Valley Research Laboratories, Inc. Oct. 10 1945. 630,258.

Adhesive resinous compositions.—B. F. Goodrich Co. Dec. 27 1943. 630,140.

Method and apparatus for distilling carbonaceous material.—V. F. Parry. Nov. 4 1946. 630,142.

Heat treatment of magnesium base alloys.—Aluminum Co. of America. Aug. 31 1944. 630,211.

Manufacture of interpolymers of styrene with polymeric fatty acid esters and coating compositions obtained therefrom.—L. Berger & Sons, Ltd., L. E. Wakeford, F. Armitage, R. H. Buckle, and E. Booth. [Legal reprentatives of D. H. Hewitt (deceased)]. Dec. 6 1946. 630,022.

Froth flotation of copper sulphide minerals.- American Cyanamid Co. Jan. 1, 1946. 630,213.

Preparation of powdered metallic oxides into modules.—H. W. K. Jennings. (Brassert & Co., H. A.) Dec. 16 1946. 630,089.

Process of preparing esters of penicillin G.—Merck & Co., Inc. Dec. 20 1945. 630,264.

Removal of water from tetrahydrofuran.—I.C.I. Ltd., J. G. M. Bremner, R. R. Coats, and M. A. E. Hodgson. Jan. 3 1947. 630,149.

Hardening of proteinaceous substances. —BX Plastics, Ltd., and S. H. Pinner. Jan. 8 1947. 630,150.

Refractory articles and their manufacture.—Carborundum Co. Jan 12 1946. 630,268.

Production of resinous articles.—I.C.I., Ltd., R. M. C. Arnot, and R. Hammond. Jan. 29 1947. 630,026.

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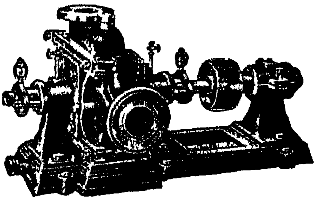

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Volume LXI 26 November 1949 Number 1585

Coal Gas and Chemicals

FROM any picture of the coal gas industry in recent times cannot be excluded a very large and important sector of chemical industry. The materials of fertilisers, dyestuffs, plastics and nylon filament, pharmaceutical and fine chemicals and motor fuel, all come so fully in one or other of the processes of extracting and processing the main product of the vast gas industry that few sections of chemical industry itself could escape serious impoverishment if those services were curtailed. Some closely related chemical industries could not operate at all. Those facts are known to almost everyone and few have not heard of the great coke oven batteries at Beckton, whose output of chemical raw materials is larger than that of any of the numerous plants of the kind at work today.

There is thus some excuse for thinking that an enterprise so essential to nearly every industry in the country and of such vast proportions as that which has been taken over by the Gas Act must be a venerable edifice. In fact, the modern gas industry is almost entirely a recent creation compared even with some of the chemical industries it serves, although its antecedents are antique enough to qualify it for a place in an industrial Debrett. Without the orginality and vision of William Murdoch, Boulton and Watt's young Scottish assistant, in carbonising coal to light with gas his house at Redruth in 1792—as the ninth Earl of Dundonald had himself done about 12 years earlier—a generation or so might well have elapsed before a start was made on the great adventure of converting Londoners to use a more scientific source of lighting than whale oil and tallow. Murdoch and the Scottish nobleman were, however, only the precursors of a great procession of visionaries and merchant venturers, whose determination in the face of all imaginable impediments conferred on the country means of tapping more abundantly the greatest single source of chemical raw materials. That, paradoxically, was possibly the last of the incentives which drove on such men as Frederick Winsor (and Lebon in Paris, from whom he filched all the first principles), Samuel Clegg, James Ludovic Grant, Frederick Accum, James Hargreaves and their contemporaries, adversaries and successors, whose story has now been brought to life with a wealth of colour and detail in "The History of the Gas Light and Coke Company, 1812-1949."* The title seems to do less than justice to the

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* "The History of the Gas Light and Coke Company 1812-1949," Stirling Everard; Ernest Benn, Ltd, 63s

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

book, for the story of the company, first in that strange and chequered field, is the story of the birth of the coal gas industry, of which so many eminent figures in the history of scientific advance—Sir William Congreve, Davey, Dalton and others—acted as consultants.

The fortunes of the gas industry can now be seen to have been the prototype on a grand scale of the pattern of many other chemical processes in their early stages. First objectives prove to be will-o'-the-wisps in the light of the greater attractions of simple alternatives or by-products and success comes from the unexpected quarter. Thus the thermal properties of coal gas weighed hardly at all in the estimates and hopes of those who secured in 1812 the Prince Regent's signature, on behalf of George III, to the Charter permitting the Gas Light and Coke Company to supply gas for 21 years to the Cities of London and Westminster and the Borough of Southwark, etc. The whole of the early history was concerned with the herculean struggle to convert London to acceptance of the batswing gas light and to disregard the highly suggestive evidence provided by the frequent conflagrations and the evil-smelling concomitants, in which sulphur and a great range of tar products mutely clamoured for recognition. To this there appear to have been but two exceptions, the ammonia products, sal ammoniac and sulphate of ammonia, and coke, for which steady markets were built up in less than 20 years. Of the possible advent of "Mr. Therm" there was no hint.

It is a sobering reflection that the Gas Light and Coke Company and many others for more than a generation steadfastly regarded most by-products as unmitigated nuisances. The feeling is well illustrated by the Gas Light and Coke decision, in 1814, to rescind the appointment of one who would now be styled a by-products research director—with a gift of two guineas "for wasting his time." An ocean of tar was passed surreptitiously through the waste pipes to the unfortunate Thames or, at a more enlightened stage, was carbonised purely for its gas content; great quantities of ammonia liquor, when neglected markets slackened, joined the wasteful flood of effluent. That aspect of the story, which a contemporary congress

(continued at foot of page 726)

Notes and Comments

Chemical Trade with U.S.A.

THE overseas trading accounts for October have more interest than most of their monthly predecessors because of the glimpses they afford of imports since devaluation. While no illusions can have been entertained that chemical materials from dollar sources would not involve very much higher payments in terms of the cheaper exchange, some typical effects are striking. Examples are borax, of which 9900 cwt. was acquired in October, 1948, for £13,111, while 14,511 cwt. last month cost £25,692; glycol ethers, etc., requiring in one month £12,668 for 221,300 lb. last year and £30,898 for 308,241 lb. in October last; and carbon blacks, of which some 41,000 cwt. imported in October cost round about £2000 more (£188,078) than did approximately 60,000 cwt. 12 months before. The limitation of expenditure in October on U.S. chemicals to some £483,000 (£767,900 in October last year) appears to reflect a very stringent pruning. Chemical exports to the U.S.A. in the same period were reduced to £137,000 (£151,000 in October last year). The grand total of the overseas chemical trading account, £7,640,000 for all groups, compared with £7,170,000 12 months ago, may not have borne the whole effect of new currency values, but it clearly shows a solid contribution by chemical industries towards balancing the export account by direct sales.

Invasion Tactics

ELSEWHERE in this issue Sir Ernest Benn comments in characteristically blunt and practical terms on the little lecture with which the Prime Minister recently favoured industry at large on shortcomings in the dollar export drive. Our New York correspondent also has something to add towards conveying a more realistic picture of what one of the British exporter groups is doing. His contribution concerns the Associated Paint Manufacturers, Ltd., the 140-odd makers who, more than 18 months ago, set aside a wide diversity of entrenched commercial policies to invade the overseas markets under one standard, the collective trademark "Asopan." Paint industry experts in New York and farther afield have now witnessed with something verging on incredulity the effects of the first sortie of the Asopan force in their home preserves. Paint sales in the U.S.A. are worth the equivalent of nearly £400 million a year, at the present sterling rate, and the American paint industry is probably more highly developed than any other. Last year the share of the vast annual turnover which fell to the United Kingdom is stated in New York to have drained off only $100,000 of approximately $1000 million the U.S.A. spent on paint. That, however, was before the APM task force had been briefed. Now, it is being noted in New York, Asopan can be found in all the states in the Union and knowledgeable paint executives do not disguise the fact that it may represent a real competitive factor, even if it need not be regarded as a serious threat.

Chemical Engineering Students

ONE of the most welcome announcements to have come recently from the Ministry of Supply is the news this week that it is to make its own contribution to the facilities for the training of chemical engineers. It is a small offering, embracing the further education of only 12 students each year, but, so urgent is the need for qualified chemical engineers, the new proposal is not to be despised. The scheme, to begin shortly, will give training in chemical engineering to selected apprentices in Ministry of Supply and development establishments and Royal Ordnance factories The 12 engineering apprentices to be picked each year must have completed their third year of training under the

Ministry's apprenticeship scheme. At least half of them will be accepted as full-time students for the B.Sc. degree in chemical engineering or the professional examinations of the Institute of Chemical Engineers. They will study at Universities and technical schools, spending their vacations in practical work at the establishment of the Ministry to which they are attached.

Slow Release of Metals

OPTIMISTIC hopes that prices of base metals as well as their chemical derivatives were soon to be relieved of the burden and expense which Government control has imposed during and since the war prove to have been premature. The grip of this particular Old Man of the Sea (whose habitat is somewhere in the Ministry of Supply) is not likely to relax in the immediate future, according to those who would gladly see him unseated. Meanwhile, the deliverance of tin into the safekeeping of the partly resuscitated Metal Exchange, on November 15, has not yet brought the measure of freedom in supplies and prices which a free market can, and will confer. Although there has already been some assurance of a welcome retreat from the Ministry price levels for tin—which seemed at times to have belonged more properly to the bullion market—the full benefits cannot be enjoyed while the free market is occupied in re-establishing the lines of supply which the Ministry, before it abandoned them, is reported to have emptied as thoroughly as would an army making an orderly retreat. The Ministry's "loot" is admitted to be 31,000 tons of tin and it shows no intention of releasing any of it at the moment to relieve the needs of industry.

No Cheap Copper

THAT policy is hard to justify, notwithstanding the need of a strategic stockpile, and cannot be reconciled with the Administration's simultaneous demands for new records for industrial production. Whether copper, and perhaps lead, escape from the Government reservation before 1950 is well spent is still wholly uncertain, but there would seem to be little likelihood of any substantial easing of official prices for copper for a long time. That is implicit in the disclosure this week by Mr. A. Chester Beatty, chairman of Rhodesia's Roan Antelope copper mining group, the the Ministry has virtually agreed to receive the next three months' copper output at the New York price for electrolytic copper (17.672 cents per lb.), converted at the new dollar rate. That will assure the Northern Rhodesian producers about £136 per ton for blister copper, which is rather more than £15 per ton higher than the United Kingdom was paying in the last financial year. Non-ferrous metal users may be excused a pang of jealousy when they observe the Ministry of Supply's tender treatment of producers.

COAL GAS AND CHEMICALS

(continued from page 724)

on conservation of resources might well take as a classical cautionary tale, was one of the unavoidable results of the absence then of anything equivalent of the Institution of Chemical Engineers and of any recognisable group of people who could have qualified for admission, had it then existed. The men who could have accelerated so greatly the cultivation of the huge field of ancillary activities had not yet arrived and a century was to elapse before that gap was adequately filled. The full awakening, like that of so many departments of chemistry, was delayed until the shock administered by critical scarcities in 1914-18 stirred many to action. The return since then has been immensely rewarding and the process of expansion, even now, is not ended. In token of that was the creation last year of the Coal Tar Research Association, supplementing the wide hydrocarbons research of the Chemical Research Laboratory and the work of the Fuel Research Station, the Gas Research Board and others. The national board which has inherited the great enterprise built up by the gas pioneers and their very able successors has a clear responsibility to exploit further the service gas production can render to chemical industries.

CHEMICAL EXPORTS IN OCTOBER

September and 1948 Totals Surpassed

BRITISH chemical exports in October showed an increase in value, both when compared with September and with the corresponding month last year. October's figure for all chemicals was £7,640,808, against £7,170,726 in the same month of 1948 and £6,994,535 in September this year. These totals include chemical manufactures; drugs, medicines and preparations; dyes and dyestuffs; and paints, pigments, colours extenders. In both comparisons, the figure for value of "chemical manufactures" accounts for more than all the total increase. Notable increases in October 1949 compared with 1948 were: ammonium sulphate 43,463 tons (25,104); tar oil, etc., 4,004,273 gal. (1,580,087); collodion cotton 2264 cwt. (1062); disinfectants 55,500 cwt. (50,535); tetra-ethyl lead 122,937 gal. (107.100); caustic soda 271,344 cwt. (182,998); sodium silicate 33,117 cwt. (27,874); sodium sulphate 56,986 cwt. (39,384); tin oxide 744 cwt. (562).

EXPORTS

	Oct. 1949	Oct. 1948
	Cwt.	Cwt.
Formic acid	3,090	3,539
	Lb.	Lb.
Salicylic acid and salicylates ...	169,694	184,056
Value of all other sorts of acid ...		
	Tons	Tons
Aluminium oxide	98	648
Sulphate of alumina	2,756	3,463
All other sorts of aluminium compounds	2,238	458
Ammonium sulphate	43,463	25,104
Ammonium nitrate	3,191	9,520
All other sorts of ammonium compounds	1,638	2,098
	Cwt.	Cwt.
Bleaching powder	13,568	21,218
All other bleaching materials ...	9,099	9,717
	Gal.	Gal.
Cresylic acid	132,451	184,081
Tar oil, creosote oil, anthracene oil, etc.	4,004,273	1,580,087
Value of all other sorts of tar oil ...	£76,000	£60,602
	Cwt.	Cwt.
Collodion cotton	2,264	1,062
	Tons	Tons
Copper sulphate	649	1,221
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	55,500	50,535
	Tons	Tons
Fertilisers	1,786	918
	Cwt.	Cwt.
Nickel salts	4,041	5,967
Lead acetate, litharge, red lead, etc.	5,378	17,188
	Gal.	Gal.
Tetra-ethyl lead	122,937	107,100
	Tons	Tons
Magnesium compounds	520	909
	Gal.	Gal.
Methyl alcohol	5,608	13,971
	Cwt.	Cwt.
Potassium compounds	4,923	7,970
	Tons	Tons
Salt	18,573	19,995
	Cwt.	Cwt.
Sodium carbonate	311,050	401,165
Caustic soda	271,344	182,998
Sodium silicate	33,117	27,874
Sodium sulphate	56,986	39,384
All other sodium compounds ...	91,177	96,771
Cream of tartar	406	371
Tin oxide	744	562
	Tons	Tons
Zinc oxide	1,442	1,362
Total value of chemical manufactures, excluding drugs and dyestuffs	£4,383,177	£4,101,775
	Oz.	Oz.
Quinine and quinine salts ...	100,418	198,787
	Lb.	Lb.
Acetyl-salicylic acid	156,201	81,537
	100 International units	100 International units
Insulin	1,060,645	1,231,807
	Mega units	Mega units
Penicillin	881,084	314,672
Total value of drugs, medicines and preparations	£1,608,853	£1,359,848
Total value of dyes and dyestuffs ...	£585,563	£578,118
	Cwt.	Cwt.
Plastic materials	36,607	41,562
Value	£437,178	£476,648
	Cwt.	Cwt.
Chemical glassware	1,240	1,506
Value	£48,643	£44,276
	Cwt.	Tons
Fans	5,703	185
Value	£138,199	£121,267
	Cwt.	Tons
Furnace plant	6,244	361
Value	£85,446	£68,976
	Cwt.	Tons
Gas and chemical machinery ...	26,565	1,067
Value	£307,633	£250,597

IMPORTS

	Oct. 1949	Oct. 1948
	Cwt.	Cwt.
Acetic acid	—	21,962
Boric acid	2,801	1,000
All other sorts of acid	1,527	4,107
Borax	14,400	9,900
Calcium carbide	—	67,373
Coal tar products * (excluding benzol and cresolic acid) ...	—	14,511
Cobalt oxides	271	742
	Tons	Tons
Arsenic	—	422
Fertilisers	35	13,631
	Lb.	Lb.
Iodine	—	67,058
	Cwt.	Cwt.
Potassium chloride	767,165	841,273
Potassium sulphate	78,200	12,800
All other potassium compounds ...	2,868	4,008
Sodium nitrate	99,530	79,760
All other sodium compounds ...	4,741	2,605
Carbon blacks (from natural gas)	41,116	60,671
Total value of chemicals, drugs, dyes and colours	£2,003,915	£2,599,628

MANCHESTER PIONEERS

The Growth of Chemical Industry

EARLY pioneering achievements in the production of salt and sulphuric acid were really only a preliminary to greater things. The real beginning of the chemical industry in the Manchester district was the Le Blanc process for soda production, first carried out at Liverpool and later at St. Helens.

Rudimentary development of chemicals was carried on in crude efforts to make the heavy acids, soda, bleach and soap, some tar products and simple natural colours for textiles.

These were cited as among the milestones in the growth of the chemical industry in the Manchester district, described by Mr. N. Swindin in a paper presented to a meeting of the Institution of Chemical Engineers (North-Western branch), held in Manchester last week.

He recalled that in 1836 Gossage's absorption tower added hydrochloric acid to the list of heavy chemicals. Bleach was made by Tennant and by Henry Deacon (1822-77), who, among other processes, invented the first catalytic process of manufacture of chlorine from hydrochloric acid.

In 1891, Hamilton Young Castner, a young American chemist who had come to England in 1886, developed a process for the isolation of sodium by the electrolysis of brine and with Kellner, an Austrian interested in the same problem, established the Castner-Kellner process at Weston Point.

A tribute to the ability of William Hesketh Lever, a genius of business organisation, was paid by Mr. Swindin, who also referred to Ivan Levinstein, who, when only 19 years of age, established a works at Blackley to manufacture dyes; thus Clayton Aniline was established in 1876.

Some details were given of the work of George E. Davis and of Professor Osborne Reynolds.

S. Porter & Co., Ltd.

Attention of users of chemical leadwork is directed to the fact that S. Porter & Co., Ltd. (associated with Nordac, Ltd.), established supplier in this field, is continuing to operate at Dukes Road, Western Avenue, London, W.3 (telephone Acorn 2289).

The company's advertisement (The Chemical Age. *61*, *xvi*) gave inadvertently the address which will be occupied early next year.

UNJUSTIFIED ATTACK

Impediments to Export Enterprise

IT is impossible to pick up every sneer that now comes from high places—writes Sir Ernest Benn—but a remark of the Prime Minister at the Lord Mayor's Banquet should be challenged. The habit of attributing slackness to our business men is spreading and the cruel injustice of it can hardly be appreciated except by its victims. Mr. Attlee spoke of "North American buyers hunting through our markets and meeting with little response except circumstantial accounts of order books filled with business from the home market and soft currency territories."

A typical circumstantial account would relate how months have been wasted securing the necessary permits and materials for an order for some old customer on the Continent, how the order was halfway through and would take another few months to complete.

The Alternative

The lay reader is unlikely to appreciate the position. The Prime Minister's outrageous suggestion is that such a manufacturer should cancel his contract for the Continent, render himself liable to all sorts of penalties for failing to comply with licences already granted, stop the order halfway through and start again on the weary process of persuading the Board of Trade that the necessary permissions for an American order should be granted.

All that the business man can do is to shrug his shoulders and get on with the job, lacking almost all incentive and any sort of encouragement.

Nuclear Physics Talks

A CONFERENCE of the Physical Society will be held in the Physical Department, University of Birmingham, Edgbaston, on December 10, 9.30 a.m. to 4.30 p.m., when a series of papers on nuclear physics will be discussed.

In the morning session G. F. J. Garlick will speak on "Crystals for Scintillation Counters," and Prof. R. E. Peierts on "Speculations about the Origin of the Elements."

"Life-times of Excited Nuclear States," will be the subject of the first paper in the afternoon session by Mr. D. E. Bunyan, who will be followed by Dr. J. Lindhard, speaking on "The Shell Models of Nuclear Structure."

CHEMISTRY AND BUILDING TECHNIQUE

Representative Exhibits at Olympia Exhibition

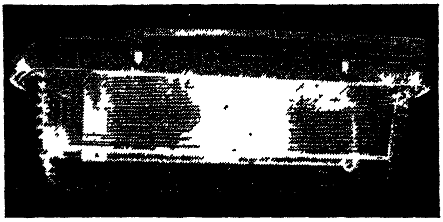
THE work of the chemist and metallurgist in producing new and better materials, equipment, and processes in connection with domestic and industrial building is exemplified in many of the exhibits at the 23rd Building Exhibition, which opened at Olympia (London) on November 17 and continues until December 1. There has been a good attendance of potential buyers from overseas and many others have signified their attention of visiting the exhibition.

The recognised need for special treatment of stone, concrete and cement surfaces intended for heavy duty, to make them harder, and more water- and weatherproof, is claimed to have been met by the range of solutions shown by Silicaseal, Ltd. Ethyl silicate forms the base of these products, which are essentially colloidal solutions of silica in alcohol and in application leave a " glue " of silica which hardens to a glass-like consistency.

The exhibit of Dohm, Ltd., includes examples of a wide range of powdered raw materials for many industries, among them exfoliated vermiculite, which, besides being used in building as a featherweight aggregate and insulating material, is finding increasing application as a packing material in place of wood wool and sawdust. The last is increasing, especially in connection with the packing of laboratory equipment and fragile glassware generally. It is chemically inert, and has already been used in America for packing eggs for transport over long distances. A new plant for the exfoliating of vermiculite has just been established by the associated firm of Logan, Sons & Co., Ltd., 163 West George Street, Glasgow.

Paint and Plastics

The I.C.I. display serves to reveal the wideness of the range of building materials produced by its paints, plastics, metals and Billingham (cement) divisions. A conspicuous trend is the growing use of corrugated Perspex for roof lighting and of Perspex generally in domestic fittings, including wash basins and other kitchen and bathroom units.



[Courtesy, General Electric Co., Ltd

Street lantern for sodium lamps, with dish and refractor plates of Perspex

The plastics section of this exhibit also shows Alkathene tubing for plumbing services, PVC coated fabrics for upholstery and flooring, Nylon paint brushes, and Nuron laminated boards. Perspex is finding a new and promising use in electric lighting installations, especially for street lamps, in which the " dish " of the lantern and the refractor plates are made of it.

The I.C.I. metals division exhibit focuses attention on the many uses of non-ferrous metal products in building construction. Prefabricated copper panels for roofing are shown, and the easy assembly and neatness of a copper tube installation is demonstrated by the display of a plumbing assembly utilising light gauge copper tubes and fittings of the compression and capillary type.

A general illustration of the use of non-ferrous metals in building construction is provided by the exhibits of the Zinc Development Association, the Lead Industries Development Council, and the Copper Development Association.

On the stand of the Zinc Alloy Rust Proofing Co , Ltd., are examples of architectural ironwork rust-proofed by the Sheradizing process, which is essentially a low temperature heat treatment.

The Fire Protection Association's stand is a reception centre for architects, builders and others, where advice is given on all phases of fire protection and prevention in relation to domestic and commercial buildings and building materials. The scientific processes involved in the various recommended methods are those developed in collaboration with the DSIR.

The exhibit of the DSIR includes pictures of metal pipes which have become corroded in various soils in which they had been buried, and literature is obtainable on recommended methods of corrosion prevention, including the galvanic protection of metals subject to corrosion in aqueous media.

Growth of Support for Scientific Films

Aid for Research Workers Planned at Brussels

by STANLEY W. BOWLER, F.R.P.S., F.R.S.A.

THE growing awareness of the scope of the scientific film in education and research work may be indicated by the fact that 32 nations sent delegations or observers to the third congress of the International Scientific Film Association, recently held in Brussels.

The delegation from Britain, which was the largest, consisted of 14 members of the Scientific Film Association of Great Britain, and included representatives of the Royal Photographic Society, the Royal Society of Medicine, the Scottish Film Council, and observers from the British Council and the B.B.C. Television Service.

The largest theatre of the Palais des Beaux-Arts seats about 2500 people and it was packed for the first public showing of general interest films, at which the Queen Mother of the Belgians was present. Of the 150 films shown during the congress Great Britain submitted 18.

A Russian Film

On the second evening, a programme of films on scientific research was given, and among these was one from the U.S.S.R., in colour, entitled "The World of Crystals." The film contained scenes of crystals of many kinds, including sequences of growing crystals with the most brilliant hues, and might well serve to intensify interest among students in this field of chemistry.

Films at other sessions showed brilliant examples of cinemicrography and other difficult techniques. Two special sessions were devoted entirely to medicine and surgery, media for which the use of cinematography is most advanced.

Two sessions of the congress were devoted to industrial films, and at the first of these Shell's "Pattern for Chemicals" was shown. This film is particularly interesting for its treatment of molecular symbols in model form. The unusual introduction of hands in stylised positions to point the changes in molecular grouping aroused some discussion. At the second session a short 16 mm. film in colour, "The Nature of Plastics" (THE CHEMICAL AGE, *60*, 536) was screened. Films of this kind are sufficiently popular in appeal to play an important part in bringing to general notice the important part which chemicals play in daily life.

The proportion of films dealing with chemistry was low, probably due to the reluctance of many research associations or manufacturers to release information to the general public.

At the proceedings of the general assembly it was agreed to set up three new groups, one of which is to deal with the use of cinematography in pure science and research. It is hoped during the next year to begin documenting on an international scale the work in this field, by collecting the names and special interests of research workers using film, and also to build up a reference library of information about existing research films and film records, specialised techniques, etc. At a later stage it may be possible to publish the results of this survey so that a research worker in one country can communicate with a fellow worker in another. It is also hoped that the documentation of film techniques may provide assistance to the "lone worker" who needs some particular information to enable him to proceed with a task.

The next congress of the association is now being planned and it is hoped that it will take place in Milan, a convenient university and industrial centre, towards the end of September 1950.

Isotopes by Air

A METHOD of facilitating the transport of radioactive isotopes by aircraft is reported to have been devised for the use of South African Airways.

One of the main problems has been to provide shielding without the heavy lead casing normally required. In the new method the isotopes are enclosed in small metal containers which can be housed remotely in the wings of the aircraft.

The containers have rings so that they may be handled by long rods. When in position in the wing tips the isotopes are said to have no effect on crew, passengers or even sensitive photographic plates carried in the machine.

Before such containers can be used, permission of all the countries on the route to Johannesburg would have to be obtained.

SOLID FUEL AND BUILDING LAYOUT

Minimising Manual Work in Handling *

by J. B. PINCKHEARD, A.R.I.B.A.

THE design of solid-fuel storage arrangements plays an important part in providing efficient technical services in buildings.

The object of fuel storage is, of course, to provide a reserve which will enable heating and other installations to continue working over a reasonable period without the necessity for frequent small deliveries. Important factors to be borne in mind are the type of boiler plant, means of access and methods of delivery and stacking both within the building and in the open air. The chemical and physical properties of solid fuel are considered also so far as they affect the planning and design of storage arrangements.

For general guidance it may be said that provision of storage capacity equal to four weeks' peak-load requirements should be the minimum aim in all new buildings. With factories this figure should be increased if possible to six weeks. It will frequently be possible, *e.g.*, in buildings on open sites, to provide accommodation considerably in excess of these figures. On the other hand, with buildings in densely built-up areas with high site values it may be extremely difficult always to satisfy this suggested minimum, and the pressure of other accommodation may compel some relaxation in the storage requirements.

Bulk Problems

The space required, weight for weight, by different types of fuel varies widely; coke, for example, requires roughly twice as much space as the same weight of coal. Table 1 gives the bulk densities of three different solid fuels and their approximate calorific values expressed as therms per cu. ft.

TABLE 1.—BULK DENSITIES AND CALORIFIC VALUES OF DIFFERENT FUELS

Type of fuel (1)	Cu. ft. per ton (2)	Lb. per cu. ft. (3)	B.Th.U. per lb. (4)	Therms per cu. ft. (5)
Anthracite ...	41–37	55–60	14,500	8.0–8.7
Bituminous coal	45–41	50–55	12,000	6.0–6.6
Coke	100–90	22–25	12,000	2.7–3.0

Apart from the question of spontaneous combustion, which cannot be considered a serious risk in stocks of less than 200 tons, coal does suffer some deterioration, whether stored in the open or under cover. The deterioration is considerably less in extent than is commonly supposed, and it may be either chemical or physical.

Chemical deterioration takes the form of loss of calorific value due to slow surface oxidation accompanied by loss of coking power. Physical deterioration occurs as the formation of fines by disintegration, or the loss of calorific value due to increase in moisture.

Disintegration

The loss in calorific value due to oxidation varies with the type of coal stored, being greater for bituminous coals than for anthracite. It rarely exceeds 1 per cent, which is less than the variation in the efficiency of utilisation. Chemical deterioration occurs almost wholly in the first 6 to 12 months of storage. Once this period has elapsed stacks should be maintained undisturbed as long as possible, as subsequent deterioration is negligible. Conversely, deliveries of fresh coal should be consumed with the least possible delay, to avoid prolonged atmospheric exposure.

The amount of physical disintegration which occurs is dependent both on the type of coal and on the season, being greater in winter (owing to frost) than in summer. Disintegration may be a disadvantage where sized coal is being used, since the fines are liable to fall unburnt through the grate. Weathering is only one of a number of causes of the production of fines. They are produced every time coal is handled, and certainly by the practice of filling road vehicles by dropping coal from rail wagons at high level. There is no evidence that the proportion of fines is seriously increased by storage compared with the degradation due to normal handling.

The increase in surface moisture content of coal stored in the open may, in bad weather, be as much as 10 per cent, and the fuel required for driving off this moisture in the furnace will lead to a decrease in effective heat generation of about 1 per cent. On the other hand, damping sometimes improves the efficiency of combustion of certain coals.

It will be clear from the foregoing that the deterioration of coal in storage, both physical and chemical, is not serious in comparison with losses from other causes, and that its total effect is not likely to exceed 2 per cent of the calorific value. Furthermore, much of the deterioration occurs irrespective of whether the coal is stored under cover or in the open air.

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* Abstracted from a paper delivered in London this week to the Institute of Fuel.—"The Storage of Fuel in Relation to Buildings."

There is no evidence to justify the provision of extensive covered storage space for reserve coal stocks, for the capital cost of such accommodation would considerably outweigh the doubtful small savings which might be achieved in running costs.

[The paper notes that spontaneous combustion, arising from oxidation, occurs only in large stacks of coal and is seldom experienced in stacks of less than 200 tons. Coal of uniform size rarely causes trouble, and the majority of cases of spontaneous combustion can be traced to the mixture of fines with larger coal.]

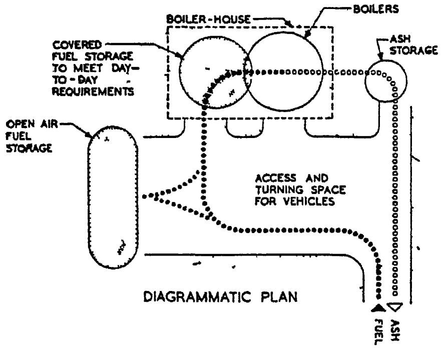
BOILER-HOUSE
BOILERS
COVERED FUEL STORAGE TO MEET DAY-TO-DAY REQUIREMENTS
ASH STORAGE
OPEN AIR FUEL STORAGE
ACCESS AND TURNING SPACE FOR VEHICLES
DIAGRAMMATIC PLAN
FUEL
ASH

Fig. 1

It was for long believed that wet coal was more liable to oxidation than dry, but this is not the case. The risk of spontaneous combustion is greater with the increase in height of the stack. Freshly mined bituminous coals should not be stacked higher than 8 ft., although in some types and sizes stacks are permissible up to 16 ft., and anthracite may be safely stacked up to 30 ft. high. Ventilation is the most effective preventive measure.

Unlike coal, coke is not subject to chemical deterioration, and can be stored in large quantities without special precautions. There may be some increase in moisture content during storage, and disintegration may occur with consequent formation of fines, particularly if the coke is exposed to heavy frost.

For large buildings situated on open sites requiring the maintenance of considerable stocks of fuel, open-air storage is normally the most economical arrangement. In addition, covered storage sufficient for, say, a week's supply, must be planned in conjunction with the boiler-house to provide for immediate requirements. The outdoor storage provides a reserve from which the covered store can be replenished when required.

Deliveries of coal should be made to the store serving current requirements and not to the open store, where each fresh delivery would be successively exposed to the effects of atmosphere and weather. The reserve fuel once laid down should be disturbed as little as possible and may well remain for several years. Fig. 1 illustrates diagrammatically the flow of coal through the storage accommodation.

The planning of fuel storage accommodation in buildings, particularly in densely built-up areas, is usually much more involved than the provision of storage on an open site.

Certain objectives should be kept in mind. First, suitable access for deliveries; secondly, reduction in the amount of manual handling needed; and thirdly, the fullest use of the available storage space.

Means of Transfer

The transfer of fuel from bunkers to boiler may be achieved manually, by mechanical means, by gravity or by a combination of two or more of these methods. A gravity feed system is obviously the cheapest to run, but it requires careful planning of the levels of the boiler room and the fuel store.

In urban buildings, quite apart from consideration of fuel storage there are good reasons for keeping the boiler room at basement or even sub-basement level. Where this is done there should be little difficulty in ensuring the gravity-assisted movement of fuel (Figs. 2 and 3).

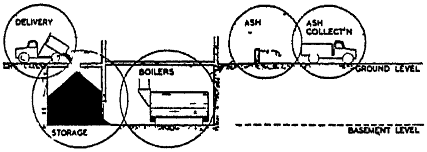

Fig. 2

In building on open sites, where heating chambers or boiler houses are more likely to be planned at ground level, it is not easy to arrange for gravity feed. There is also the problem of how to store the fuel compactly. Using ordinary methods of delivery the height of the stack cannot be increased, without hand trimming, beyond 4 ft. 6 in. A given quantity of fuel spreads over a greater area, therefore, than it would in an urban building with comparable requirements. In addition, longer runs are involved when barrowing fuel from the stack to the heating chamber.

If in a particular building there are good reasons why the heating chamber should not be sunk below ground level, consideration should be given to the possibility of delivering fuel to a point sufficiently elevated above ground level to permit gravity feed. This may be achieved by the use of a ramped access road, and occasionally by taking advantage of a sloping site.

A third possibility, as yet almost unknown in this country, is the use of mobile handling equipment carried by the delivery vehicle, with the aid of which the coal merchant would deliver to an elevated store.

Bunkers should be planned so that they can be readily filled and emptied and so that fuel flows by gravity from a filling opening at the top to an outlet at the base. They should be so designed that undue segregation does not occur, either in filling or during the passage of the fuel through the bunker.

Particularly in urban buildings it is important to plan the bunkers so that the potential storage space available is fully utilised. Bunkers should always be provided with access doors or manholes so that fuel can be trimmed.

Segregation can be prevented to some extent by proper design of the bunkers. Segregation occurs particularly when coal is dropped from a height in such a way that it forms a conical heap of progressively increasing size

This can be obviated partly by limiting the distance which coal drops when it is fed into the bunker, and for this reason very deep bunkers should be avoided unless there are means of breaking the fall of the coal. A depth of 10 ft. is suitable. Also the openings should be arranged so that there is not a tendency for single large cones to form. For this reason a larger number of more closely spaced openings is preferable to a single one.

Problems of Segregation

Segregation occurs also during the emptying of the bunker when craters develop over the outlets, and again the larger coal tends to roll to the bottom. This effect can similarly be mitigated by having a larger number of openings through which the fuel is discharged, so that the level of the stored coal is lowered evenly without the formation of large craters.

Internal vertical divisions within the bunkers are an advantage in this respect, but are open to the objection that they obstruct the shifting of fuel from one section of the bunker to another.

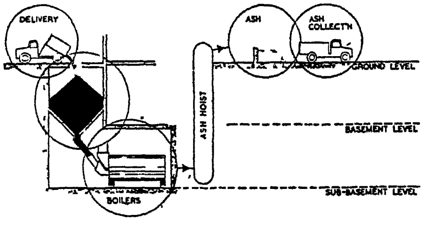

Fig. 3

With bunkers which are filled through fuel openings in the top it is always difficult without hand-trimming to ensure that the space is properly filled. With a single opening a cone of fuel is formed, the corners of the bunker being left unfilled. The bunker can be much more effectively utilised if the number of openings is larger.

Bunker Design

It is quite usual with bunkers in industrial buildings to leave the tops open except for a metal grille capable of sustaining the weight of vehicles, the mesh being determined by the size grading of the fuel used. With this arrangement there is no difficulty in completely filling the bunker, and segregation is minimised.

Where bunkers are designed to be self-emptying the bottoms should slope at an angle of not less than 45° with the horizontal. An angle with the horizontal of 35° will be sufficient to keep fuel in motion which is being discharged on to an an inclined chute—as, for example, from a delivery vehicle. The minimum cross-section of such a chute should not be less than 10 times, and preferably 20 times, the size grading of the fuel.

Bunkers should always be provided with access doors or manholes so that fuel can be trimmed. Care should be taken to see that the bunkers are not traversed by service pipes, cables or ducts.

The openings through which the fuel is shot into a building should be designed in relation to the types of delivery vehicles used by the merchants. The one most used for bulk solid-fuel deliveries is the end-tipping lorry. Dimensions relating to a typical delivery vehicle are given.

A 5-ton load of coal will occupy approximately 200 cu. ft., and so a 5-ton short-wheelbase tipper with a body measuring internally 6 ft. 9 in. wide by 8 ft. 6 in. long will require sides 3 ft. 6 in. high. This is higher than normally provided by the makers but extension sides are, in fact, often added by the merchant to permit a full load to be carried.

Coke presents a special transport problem since for a given weight it has twice the bulk of coal. The 5-ton short-wheelbase tipper referred to above is less suitable for carrying coke, since no reasonable increase in the height of the sides can possibly provide the capacity necessary for a full pay load. It is for this reason that bulk coke deliveries are more economically made by the long-wheelbase lorry. This requires greater headroom when elevated.

A specialised type of vehicle which has been used to a limited extent is the rolling-floor lorry, the floor of which consists of an endless band of rubber. To discharge the load the roller at the forward end of the body is rotated manually through suitable gearing, causing the endless band to move backward and eject the contents from the rear end of the lorry.

This type of vehicle is specially suited to delivering fuel into vertical openings, since it can discharge into a much smaller aperture than is required by a tipper; further, it requires no more headroom than an ordinary lorry.

In the U.S.A. the problem of solid-fuel delivery has received more consideration than in this country, and a relatively large number of specialised solid-fuel delivery vehicles has been developed.

A widely used type is the tipper supplemented by a light elevator conveyor, carried as part of the vehicle equipment and operated hydraulically from the engine.

The great advantage of this type of equipment is that delivery can be made to a number of points beyond the reach of an ordinary tipper. Fuel can be discharged at a height normally inaccessible and also within an appreciable horizontal radius from the rear of the lorry.

Illustrations are reproduced by courtesy of the Coal Utilisation Council

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Wartime Research Reports

THE release of substantial amounts of technical information for industries is foreshadowed in an announcement by the Board of Trade concerning the programme of making available the results of wartime research, the first effect of which has been the issue of a new technical work on paints.

Most of this work performed during the war at Government centres, universities, and in private laboratories had a direct bearing on the war effort and for obvious reasons could not be publicly disclosed at the time. It is realised, however, that many of the results might be used with advantage to further the drive for greater productivity.

The large quantity of material produced is now being sifted with the object of selecting and publishing those reports considered to be of primary interest to industry or of value to research scientists.

Volume 2, on "Paints" (HMSO, 5s. 3d. post paid) contains eight reports. Three are concerned with the protection of magnesium alloys. Other subjects include the use of ground flax shives; surface treatment of brass; uses of blood albumen; and the determination of the viscosity of paints.

(*continued at foot of next column*)

Other titles in this series will include: 1, Plastics; 3, Protection and Electrodeposition of Metals; 4, Textiles and their Testing; 5, Servomechanisms; 6, Strength and Testing of Materials; 7, Adhesives; 8, Wood; 9, Powder Metallurgy.

Monsanto Tar Distillery Closing

THE reasons for the decision by Monsanto Chemicals, Ltd., to discontinue operations at its tar distillation plant at Sunderland are given in a statement by the chairman, Mr. E. A. O'Neal, jun. The lease of the property, which is owned by the River Wear Commissioners, expires on December 31, 1950, and the commissioners were informed last week that a new lease would not be applied for.

The works, states Mr. O'Neal, are no longer needed by the company as a source of raw material supplies for the other factories, and conditions have made tar distilling for Monsanto's purposes uneconomic at this site. Other secondary manufacturing operations are being transferred.

In the conditions now governing the production of tar, the works is considered not likely to be of interest as a tar distilling plant to any private enterprise. The site has, however, possibilities in other manufacturing directions and possesses valuable dock and effluent facilities.

ARTIFICIAL WEATHERING EQUIPMENT

Some Defects of Current Paint Test Methods

PAINT materials and paint technology have increased in number and complexity far more quickly than has some of the testing equipment. That conclusion was implicit in the paper presented last week before the London Section of the Oil and Colour Chemists' Association by Mr. P. J. Gay, of the Paint Research Station (DSIR) at Teddington. He dealt with simulated weathering processes, "accelerated weathering, so-called," making evident that among the defects of existing equipment the absence of any exact reproduction of effects of natural oxidation was one calling for attention.

Mr. Gay reviewed briefly the history of accelerated weathering at the DSIR research station and discussed the apparatus used originally. The outstanding point now emerging from the data, he said, was the rather poor correlation obtained between the mode of breakdown (as distinct from the rate of breakdown) in accelerated and natural weathering. In accelerated weathering there was a high probability that film breakdown with practically all types of finish in white, pale shades and some darker colours would take the form of intense chalking—a phenomenon not in accord with natural exposure results in this country. On the other hand, many dark-coloured finishes did not show any characteristic breakdown in even long periods of accelerated weathering.

Irregular Results

The typical forms of checking, cracking and flaking so frequently observed in practical paint failures were rarely observed in the accelerated weathering of gloss paints and hard finishes, which now formed the main class of materials to be tested. Accelerated weathering, therefore, in its present form could not be used to predict the type of failure likely to occur on natural exposure. He presented a table summarising the results obtained over a number of years with a wide range of finishes, which bore out the irregularity of results.

In the present state of development, accelerated weathering had clearly serious limitations as the sole test of assessing the durability and mode of breakdown of paints and varnishes. Thus, it would be relatively easy to prepare paints which would show a higher level of performance under accelerated weathering than would be anticipated from their exterior durability. However, the significance of those limitations should not be overstressed, since accelerated weathering performance was never likely to be the sole criterion on which the merits of a finish would be decided.

Mr. Gay, earlier, had reviewed the comparatively recent origin and the behaviour of artificial weathering appliances. The work of Nelson and of other American investigators between 1922 and 1930, he said, had determined the general pattern of the great majority of types of accelerated weathering apparatus until the present.

Types of Apparatus

The usual arrangement was a cylindrical tank revolving slowly about a vertical axis and with the specimens under test arranged around the perimeter. Suspended in the tank was a source of ultra-violet radiation and a means of wetting the paint surfaces. The apparatus was covered by a loose-fitting lid.

There were great differences in the sources of ultra-violet light. Nelson preferred a mercury arc, probably because it was the strongest source of ultra-violet light, but most opinion preferred the carbon arc which, though poorer in ultra-violet, was more constant in performance. In this country the carbon arc was used almost universally, but there was no agreement as to type and intensity.

There had also been variations in the manner of wetting the test specimens, but it had not been the custom to measure or control temperatures in the apparatus.

In 1947, when it became necessary to reconstruct the accelerated weathering equipment at the Paint Research Station, the whole matter of design was considered in the light of experience and likely future trends of the work. The general geometry and mechanical arrangements of the old apparatus were duplicated in the new. The design was modified to allow for more uniform distribution of the water spray, variation in the periods of irradiation and water treatment, elimination of ultra-violet irradiation during a part, at least, of the water treatment, and variation of the speed of the cycle to allow for greater amplitude in variation of film water content, etc.

Mr. Gay discussed some recent results. Regarding the status of simple water spray-arc lamp cycles, the work described was in general accord with much published work, but served to stress that the results of such cycles did not duplicate the type of breakdown obtained outdoors and did not always correlate with natural exposure results as regards overall rate of breakdown. While such test cycles could serve a useful purpose, particularly in development work, it was necessary to use a measure of caution in interpreting the results, particularly with new types of finish, where no background knowledge of natural weathering behaviour was available.

No case appeared to exist for increasing the level of ultra-violet radiation above that emitted by an enclosed carbon arc dissipating about 1 kW across the carbons. There was need, however, to control and measure the actual ultra-violet output to ensure reproducibility.

Secondly, Mr. Gay discussed the mechanism of weathering and its bearing on equipment design. The general work on weathering at the research station over many years had led to the hypothesis of two parallel factors, (1) the progressive destruction of the flexible structure of the freshly-dried film with the formation of a relatively hard brittle structure, probably by chemical reaction; (2) the failure of the weathered structure under the stresses set up by the weathering agencies, primarily temperature changes and water treatment.

Balancing the Agents

The main problem in the design of a satisfactory accelerated weathering cycle was to obtain the correct balance of intensity between the various weathering agencies so that overall breakdown was accelerated without distorting its form. The present work indicated that in the present weathering cycles film oxidation was the rate-controlling step, set by the almost universal use of an oxygen partial pressure of about 160 mms. Hg. in accelerated weathering equipment.

In the presence of that rate barrier manipulation of the other variables produced only small effects, but once that barrier had been removed by the use of higher oxygen pressures it was conceivable that the other weathering agencies would then become more critical and further progress might be made by the adjustment of those in turn.

There was some promise that ultimately a correct balance might be struck between the various weathering factors and a really close correlation with natural exposure obtained. It was conceivable, however, that no single set of conditions would prove finally satisfactory in relation to the large number of types of compositions to be tested and the variability of natural exposure conditions. The final refinements might therefore be the development of a number of specialised cycles employing different relative intensity levels of the weathering factors in the same apparatus to simulate the natural weathering of specific types of paint under defined climatic conditions.

An Improved Cycle

That final stage would be reached only after much further work, but it appeared, if the present work on the oxygen pressure factor developed favourably, that a cycle involving oxygen treatment could be put forward in the relatively near future which would overcome to a marked extent the present discrepancies between the mode of breakdown observed in accelerated and natural weathering.

No substantial change was visualised in that cycle so far as light and water treatment were concerned, for major improvements were unlikely to be achieved by the simple manipulation of those variables, although the use of a still slower cycle than one revolution per hour needed further experimental examination.

As soon as possible, said Mr. Gay, agreement would have to be reached on details of apparatus and operating conditions, if accelerated weathering were to be used generally as a routine test. The urgency of that requirement was such that agreement now in the present state of knowledge was more important than the attainment of perfection years ahead.

New Impact Test?

MONSIEUR Henri M. Schnadt, a Belgian engineer, well known on the Continent as the originator of a new system of impact testing which he proposes. has accepted an invitation to visit this country to address (in English) a meeting, on November 30. of the the Institute of Welding at the Institution of Civil Engineers, Great George Street, London. S.W.1, at 6 p.m.

While Monsieur Schnadt's theories are still the subject of lively controversy, his testing technique is stated to be finding increasing application in the Continental steel using and producing industries. From the point of view of the welding engineer, the Schnadt test offers certain advantages as an impact test permitting the testing of weld metal and heat-affected zone separately.

GLASS-TO-METAL SEALS

*Development of the Iron-Nickel-Cobalt Alloys**

PROBLEMS in the production of a satisfactory glass-to-metal seal involve the consideration not only of the nature of glass but also certain properties common to both glasses and metals.

Glass differs fundamentally from metal inasmuch as it does not solidify at a definite temperature nor in crystalline form.

Glasses intended for glass-metal seals are loosely divided into two categories—soft glasses (soda lime and lead) worked in the range 800°-1000° C., and hard glasses (boro-silicates) worked in the range 1000°-1300°C. The thermal expansion coefficients of soft glasses in the 0°-300° C. temperature range are from 80 to 105 by 10^{-7} per degree C., and those of the hard glasses range from 30 to 50 by 10^{-7}.

Certain properties of the various glasses are important in deciding whether they are suitable for glass-metal seals but the coefficient of thermal expansion is the only one of direct interest. As a rough gauge in choosing glasses to match a particular metal it may be said that the difference in expansion coefficient between glass and metal should not exceed 10 by 10^{-7} per degree C., although this need not be true for certain external seals and is never true for thin edge, thin edge tubular, internal thin walled tube and certain ribbon seals.

Zero Stress

The ideal relationship in the case where zero stress is required would be for the expansion curves for both glass and metal to coincide over the entire temperature range to the softening point of the glass, but this is never wholly achieved. The proximity of the metal and glass expansion curves at any temperature is governed by the rate of heating or cooling of the seal and the stresses in the glass in such a seal may be varied, in many instances, by the thermal treatment to which the seal is subjected.

It is difficult to estimate from purely thermal expansion measurements, what stresses will occur in the finished seal. Such stresses are best determined by photo-elastic methods.

In the earliest known examples of glass-to-metal seals the problem was overcome only by using fine gauge wire so that the expansion differences were minimised and stresses accordingly reduced. Seals to thick sections of metal could not be made.

This was the position up to the latter part of the 19th century when it was found possible to produce a glass that could be sealed direct to platinum sheet or wire without great difficulty.

The cost of platinum made the necessity for an alternative material of prime importance and eventually it was found that nickel-iron alloy thinly coated with copper, and known as Dumet, fulfilled the requirements to a large extent.

Iron-Nickel-Cobalt Alloys

The problem of making satisfactory seals was only partially solved, for Dumet could only be used in wire form, and then not thicker than .04 in.

Development of the iron-nickel-cobalt alloys (Nilo K) has largely satisfied these requirements.

This iron-nickel-cobalt alloy is polymorphic and has an alpha or body-centred form, which has a high coefficint of expansion and a gamma or face-centred cubic form, which has a low coefficient of expansion. For the temperature range 25°-450° C. the coefficient of the gamma phase is 47 by 10^{-7}. The transformation to the alpha phase does not occur at temperatures above 80° C. The gamma phase can be restored by a short anneal. Oxidation occurs at about 650° C.

The operations involved in making glass-to-metal seals are fairly simple in the case of wire seals, which are usually below 2.5 mm. diameter. Production of the larger cylindrical seals, is more difficult and necessitates more elaborate methods. In both cases, however, the glass and metal must be brought into intimate contact at a tmperature high enough for the glass to be fluid. The temperature of the metal generally equals or exceeds that of the glass.

Oxide forms on all sealing metals other than perhaps the noble metals, owing to the heating needed to soften the glass. Some authorities claim an oxide film is essential to obtain a gas-tight seal, but this is disputed.

The colour of the film formed offers a useful indication that a good seal has been obtained. In the case of molybdenum a chocolate brown colour denotes the formation of a suitable oxide. Copper coated nickel-iron alloy gives a bright red. Tungsten is usually a pale straw. Prebeading technique for Nilo K will produce a colour which may vary between grey and chocolate, depending upon the technique employed.

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* Abstracted from "Glass-to-Metal Seals," newly issued by Henry Wiggin & Co., Ltd., Birmingham.

Nilo K has great advantages over other sealing metals in that no great skill is required either in preparing the seal or in its actual manufacture. De-gassing is necessary before use, but this can be simply carried out by heating up to at least 950° C. for about 20 minutes in an atmosphere of wet hydrogen.

Fabrication of the metal presents few difficulties. Spinning is practicable, but not easy, and frequent annealings are necessary. In the case of a 1 mm. Nilo K sheet spun to a depth of ¾ in. with a diameter of 30 mm. brazing or soldering to other metals involves no trouble if the areas to be joined are free from rough edges and grease of any sort.

It is difficult to estimate the stresses in many types of glass-to-metal seals, because corrections are necessary for differential cooling of glass and metal, viscous flow of glass during cooling and changes in properties of glass through heat-treatment, while the exact temperature of retention of strain in glass can greatly modify the results obtained theoretically. Direct polariscope determinations of strain are the most reliable.

A great deal of work on the subject of stresses in glass-to-metal seals has been carried out in recent years and the extent of the knowledge now available is probably far greater than many producers and users of seals appreciate.

The company acknowledges the co-operation of J. E. Stanworth and W. J. Scott of the British Thomson-Houston Co., Ltd., Rugby, and P. E. Cane of the Edison-Swan Electric Co., Ltd., Ponder's End, in preparing the article.

Indian Oilseeds and Plastics Projects

THE movement in India to build up home chemical industries and become more independent of outside sources has markedly increased, in evidence of which is further news of projects or recommendations for development and research being planned or put in hand.

One such enterprise on which much attention has centred is the research work now being carried out at the Loyola College laboratory, Madras, under the Rev. Fr. Lourdu Yeddanapalli, professor of chemistry, for the manufacture of plastic material from oil obtained from cashew nuts.

Plans to establish a central factory and make the Indian plastic industry independent of foreign aid as proposed by the conference of All-India Plastic Manufacturers received encouraging support from the delegation headed by Mr. B. D. Garware which recently returned from visiting Great Britain and the U.S.A.

Measures to increase the production of oilseeds, improvement of marketing and distribution methods and promotion of export trade in the commodity were the principal items discussed at the fifth meeting of the Indian oilseeds committee at New Delhi. Sardar Datar Singh, vice-chairman of the Indian Council of Agricultural Research, pointed out that India's export trade in oilseeds, which used to earn considerable foreign exchange, had been decreasing for some time, and in 1948-49 the total export amounted to only 200,000 tons as against about 800,000 to 1 million tons during the pre-war period. The fundamental factor responsible for reduction of exports, he said, was the high price of Indian oilseeds, which was due to some extent to unregulated speculative activities.

The committee approved a change proposed in the present method of exporting oilseeds. Until early this year, when the export of Indian oilseeds was governed by the allocation from the International Emergency Food Council, export had to be arranged through established shippers. With the abolition of international allocation, the export promotion committee felt that exporting should be thrown open to all shippers after fixing a quota for the year. The recommendation to allow free inter-Provincial movement of oilseeds was also accepted.

Various research schemes for increasing the quantitative yield of oilseeds by improved methods of seed multiplication were approved by the committee.

The Government of India has finally decided that the location of its first steel plant shall be in the Central Provinces. The factory will be situated at Bhilai in the Drug district.

In his report to the Government of India, the American consultant, Mr. Denis, who visited Bhilai, estimated the cost of the proposed plant at $100 million.

CEMENT AND CHEMICAL PRODUCTS

French Study of Combined Operations

THE possibility of combining cement manufacture with that of other important products has long been well recognised, and to some extent realised. In a recent paper on the subject read before the Conservatoire National des Arts et Metiers, in France, Prof. H. Lafuma described some further developments in this direction (Chim. et Ind., 1949, 62 (9), 249-253).

One of the best known of the combined operations is that which relates to the manufacture of cement with that of sulphuric acid, following the ideas of Basset, with gypsum, etc., a method that was developed in Germany before and during the war by the I. G. Farbenindustrie, by Imperial Chemical Industries, Ltd., in England, and in France at Miramas. A modified form of the process was adopted in Spain, at Moncada, and by the d'Alhandra works in Portugal.

These and others similar have been described by M. Zorninger in a paper read before the Centre du Perfectionnement Technique, in 1941, and summarised by Lafuma. They involved various difficulties which, to some degree, can be avoided by envisaging not a simultaneous working, but working in series with one product at a time. Lafuma calls these " Fabrication Liées."

Two or three products may result, from double or triple " fabrication." In the former, cement is produced with either alumina, sulphuric acid, phosphorus or derivatives. From triple fabrication is derived cement with alumina and sulphuric acid, or alumina and phosphorus, etc

Cement and Alumina

The dual purpose process yielding cement and alumina involves various stages, such as (1) heating a suitable mixture of silico-aluminous mineral and limestone to obtain very friable calcium aluminates and bicalcic silicate; (2) dissolving the aluminates in very dilute alkaline carbonate; (3) precipitating lime with sodium carbonate; (4) precipitating alumina with carbon dioxide and recovering sodium carbonate; and (5) making up residue for re-heating and cement production.

Lafuma emphasises here the importance of precipitating crystalline hydrated alumina by a recycling method similar to that used with magnesia. The product of the first roasting is obtained in an extremely fine state, with particle size generally below 50 microns, which greatly expedites production of a solution of the calcium aluminates. The extent of contact surface is vastly increased and from a cement point of view the material is in fact remarkably good.

Most of the lime present is already free of carbonate, and practically the whole of the silica, iron, and alumina are combined in the mix. What may be called a super-cement is obtained. Other advantages of this method, called the Séailles process, have been noted.

Triple Fabrication

The typical example of triple fabrication is cement, sulphuric acid, and alumina, from gypsum and such other material as is necessary. The first roasting is merely to decompose the sulphate. If properly done there is no need to fear any undesirable reactions of the sulphate, and a friable or powdery clinker is obtained containing soluble aluminates. The clinker is leached to extract alumina and the residue made up or corrected for conversion into Portland cement.

Similarly, the production of cement and cast metal may be facilitated. In the first stage the metallic melt and a mixture of soluble aluminates and bi-calcic silicate are obtained either by (a) clinkering similar to that of the Basset process, or (b) fusion, with formation of blast furnace slag. Either of these may be effected during the softening stage of the calcium silico-aluminates This period of softening varies considerably with different slags, even though they have the same melting point, so that it is necessary to select those having most favourable rate of softening.

Lafuma and co-workers have given special attention to this point, in the case of auto-pulverulent aluminous mixtures, *e.g.*, in the ternary systems: C_2S—CA—C_5A_3; especially to the ratio SiO_2/Al_2O_3. This ratio preferably should be high. As practical confirmation it was found, at the d'Alhandra works, that the Basset furnace worked continuously on auto-pulverulent clinker without difficulty.

These aluminium slags have excellent purifying qualities and the metal melt obtained is very pure. After being leached for removal of the alumina the residue is available for Portland cement.

The triple fabrication of cement, alumina, and phosphorus or derivatives could doubtless be dealt with in a similar manner. The work, however, is at present only in the laboratory stage, whereas in the other cases wide confirmation has been provided. Manufacturing experience is at the moment the source of most interest. The French Service des Poudres has at present in hand the changeover of the Miramas factory—hitherto using the I.G.F. method for cement and sulphuric acid—to produce alumina and sulphuric acid, and possibly, later, cement also. Other examples include the manufacture of alumina from power station slags and of super-cement by re-roasting the residues. Two factories are mentioned: one in Czechoslovakia and the other near Berlin—during the war.

Ammonium sulphate has likewise been included in cement manufacture, based on the well-known reaction $(NH_4)_2CO_3$ + $CASO_4$ = $(NH_4)_2SO_4$ + $CaSO_3$ and using gypsum as raw material. Gypsum must, however, be on or near the site of manufacture, as costs are too high to permit heavy transport charges.

If cement production be included, *e.g.*, by addition of inert clay—which incidentally facilitates the general process—the project becomes more interesting. The carbon dioxide recovered in the waste gases is usable for preparing ammonium carbonate. The reaction then becomes:

$$CaSO_4 + 2NH_3 + CO_2 + H_2O$$
$$(NH_4)_2SO_4 + SaCO_3.$$

This is the same as or closely resembles the Séailles process, and may be regarded as profitable, since one of the products is obtained practically free of cost. The ratio of products is roughly: 12 tons cement, 10 tons sulphuric acid, and 1 ton alumina.

Lafuma concludes with a note on marine magnesia for cement, its recovery from the sea having been simplified by Séailles. The first precipitation yields a voluminous deposit; a second precipitation makes available a " seed," and by a series of such operations a hydrate is obtained which is very easily decanted and filtered. The method is similar to that used for alumina.

The magnesia is about 97 per cent pure, as compared with the usual 90 per cent. Although impurities must naturally play an important part both in magnesia refractories and cements, it is rather remarkable that, in giobertite, nature has so measured and disposed the impurities as to yield the best industrial magnesia.

In conclusion, it is pointed out that the industrial possibilities of oxyphosphate cements have by no means yet been fully explored.

Milk De-salting Process

THE firm of " Elact," G.m.b.H., of Bregenz-Vienna, has developed an apparatus which removes electro-dialytically certain salts from milk and whey and which also reduces acidity to some extent. These salts, it is pointed out, affect adversely the taste of milk product and therefore limit its uses. This is particularly true of cow's milk, with a natural salt content of 0.75 per cent, when it is turned into dry products from which other milk components (*e.g.*, fat) have been removed.

The elimination of this taste factor opens up new possibilities for the utilisation of milk and milk residue products, particularly for pharmaceutical and dietetic purposes. By the process the salts are " rinsed out." Acidulation of the fluid is prevented by a special pole reversion method, since, without this, the stability of the albumin bodies would be endangered and the albumin would separate as a flocculent precipitate. To produce 1 litre of de-salted fluid requires 1/10th kWh.—*Reuters.*

Problems For Chemical Engineers

BELIEF that solution of chemical engineering problems involved in the development of nuclear energy will provide the key to the whole situation was expressed by Sir John Cockcroft, director of the Atomic Energy Research Establishment at Harwell, speaking in Glasgow. Emphasising that the work was still in the development stages, he defined as the conditions for successful operation: the development of material which will withstand the intense bombardment inside reactors; the solution of the breeding problem; solution of the metallurgical problems associated with very high temperature operation; development of economical chemical processing for nuclear fuel; the safe and economical disposal of radioactive wastes.

The programme called for the creation of a number of experimental power producers to give experience of operating problems. Building of these would occupy the next three to five years. There was also a need for large-scale laboratory research.

Technical Publications

CHEMICALS used in fire retardant treatments and the important rôle of chemistry in the study of the initiation of fires, their extinction, inhibition and suppression are emphasised by S. H. Clarke in "Fire Research Organisation," now available as *F.P.A. Journal* reprint No. 3 which describes the work of the Joint Fire Research Organisation established by the Department of Scientific and Industrial Research and the Fire Offices' Committee at Boreham Wood, Elstree, Hertfordshire. Other *FPA Journal* reprints now issued are "Building Boards in Relation to Fire Protection" (No. 4), by R. C. Bevan, and "Fire Resistance Grading of Elements of Structure" (No. 5).

* * *

THE basic properties of lead sheet and pipe of high corrosive resistance and their flexibility and ease of working have made these materials of great value to the chemical and building industries. General information on the manufacture and use of lead sheet and pipe, application of alloys of lead and technique in lead working are contained in Bulletin No. 115 available from the Lead Industries Development Council.

* * *

DISPOSAL of by-products is an important factor in the economics of gas supply, and the extent of that undertaking at the product works at Beckton and Southall is shown in a new booklet isssued by the North Thames Gas Board. During a year this plant deals with 42 million gal. of crude oil, 9 million gal. of benzol, 105 million gal. of ammoniacal liquor and 13,500 tons of spent oxide while the refined chemicals produced are used for a variety of purposes ranging from dyes, plastics and explosives to fertilisers, waterproofing, and tar for road making. The research unit of the North Thames Gas Board is the largest in the industry for the study of problems of production and the utilisation of gas, coke, and by-products.

* * *

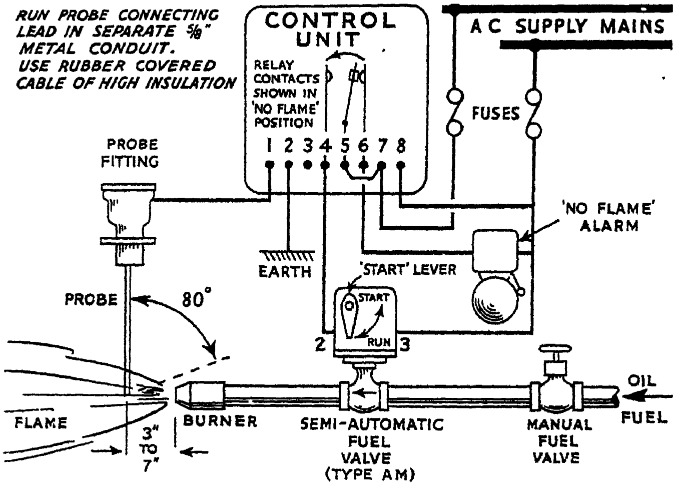
SOME of the newer electronic aids to laboratory and process work shown by Mullard Electronic Products, Ltd., at the electronic exhibition in London are illustrated with technical descriptions in the latest 16-page booklet issued by the Communications and Industrial Valve Department.

* * *

A COMPLETE understanding of why materials react in certain ways under given conditions is bound to help not only the producer but also the buyer. A concise non-technical survey on gelatin—its composition, extraction, grading, etc.—has recently been issued as a booklet entitled "The Story of Gelatine," by Alfred Adams & Co., Ltd., West Bromwich. An appendix gives the British Standards Institution methods of sampling and testing gelatin.

FURNACE SAFETY

Risk of explosion which occurs in an oil- or gas-burning furnace on re-ignition following flame failure is prevented by an automatic method in the Elcontrol Safeguard Equipment. The flame forms a part of the electrical circuit, which is automatically broken by any flame failure, thus instantly closing the fuel valve


RUN PROBE CONNECTING LEAD IN SEPARATE ⅝" METAL CONDUIT. USE RUBBER COVERED CABLE OF HIGH INSULATION
CONTROL UNIT
RELAY CONTACTS SHOWN IN 'NO FLAME' POSITION
1 2 3 4 5 6 7 8
A C SUPPLY MAINS
FUSES
PROBE FITTING
'NO FLAME' ALARM
EARTH
'START' LEVER
START
RUN
2
3
PROBE
80°
FLAME
3" TO 7"
BURNER
SEMI-AUTOMATIC FUEL VALVE (TYPE AM)
MANUAL FUEL VALVE
OIL
FUEL

[Courtesy, Elcontrol, Ltd.

· PERSONAL ·

FUNDAMENTAL matters of atomic energy were discussed in Edinburgh last week at a three-day conference of scientists presided over by **SIR CHARLES G. DARWIN**, director of the National Physical Laboratory, Teddington. **PROF. NIELS BOHR** was the principal guest of honour at an evening reception to the delegates who included representatives of nearly all the European countries, America and India.

PROF. E. L. HIRST, Forbes Professor of Organic Chemistry, University of Edinburgh, has been appointed president of the chemistry section of the British Association which will meet at Birmingham next year from August 30 to September 6.

DR. ROBERT WRIGHT has retired from Glasgow University where he had held the post of senior lecturer in physical chemistry for the past 30 years. His research work has been mainly devoted to the study of solutions.

PROFESSOR THEODOR SVEDBERG, Swedish Nobel prizewinner and professor of physics at Uppsala University, is on a visit to this country. He is chairman of Atom Energy, Ltd., the State-owned company which has the monopoly of developing atomic energy in Sweden.

PROFESSOR D. H. HEY, professor of chemistry at King's College, has been appointed to the Daniell chair of chemistry at the college. He will succeed **PROF. A. J. ALLMAND**, who will retire at the end of the 1949/50 session.

The council of the British Export Trade Research Organisation has appointed **MR. ROGER FALK** as its first director general. He is taking up his duties in the New Year but is already engaged in a survey of the BETRO activities. Mr. Falk, who is 39, is at present managing director of an advertising agency specialising in export markets.

MR. S. MITCHELL has been appointed to a senior lectureship in chemistry at Glasgow University.

MR. LEWIS GILMOUR WHYTE has been appointed a director of Petrochemicals, Ltd.

MR. A. J. HIPPERSON, who has been associated with the British Welding Research Association since its inception, has been appointed leader of a team of development and liaison engineers set up by the association to increase production knowledge in the industry.

DR. WALTER J. MURPHY, of Washington, D.C., American Chemical Society editor, has been chosen to receive the 1950 gold medal of the American Institute of Chemists for his outstanding contributions to the advancement of the chemical profession. The medal is awarded annually for noteworthy service "to the science of chemistry or the profession of chemist in America."

MR. E. V. MURPHREE, president of the Standard Oil Development Company, New York, has been awarded the Perkin Medal by the American section of the Society of Chemical Industry. This medal is given annually for outstanding work in applied chemistry. It was founded in commemoration of the 50th anniversary of the coal tar colour industry. Mr. Murphree, who in July addressed members of the Oil Industries' Club in London, on the subject of "Oil for the Future," is the holder of some 21 patents. He has published more than 25 scientific papers, on synthetic rubber, catalytic cracking, and application of the fluid solids technique to producing synthetic liquid fuels, etc.

Obituary

THE death occurred on November 20 of **MR. J. P. D. COLEMAN**, who until his retirement in 1948 was a director of Wild-Barfield Electric Furnaces, Ltd. He had served the electrical industry since 1896, and had been associated with the late Mr. E. P. Barfield from that time. He joined him again in 1919 as works manager of the newly formed electrical furnace company. He became works director in 1933.

The death is reported from the U.S.A. of **MR. JAMES R. HOBBINS**, aged 66, president of the Anaconda Copper Mining Co., since 1940. He was visiting Butte, Montana, on a routine inspection when he had a sudden heart attack, on November 14, and subsequently died. Mr. Hobbins was president of numerous other companies, and a director of the Mines Investment Corporation and other bodies.

◆ HOME ◆

Fresh Scope for Lithopone

Extensions to be carried out at the Crown Chemical Works, Birtley, owned by Durham Chemicals, Ltd., include the provision of further bays to house a lithopone plant.

Workpeople at Firm's Annual Meeting

Employees from the firm's plants at Birmingham and Willesden attended the annual general meeting of Triplex Safety Glass Co., Ltd., held in London last week. There were eight from the benches and several foreman, all members of the joint production committees.

Coal Production

Output of deep-mined coal in Britain last week was the highest since the week ending December 18 last year. Comparative figures are:—Last week: 4,520,300 tons (deep-mined 4,290,900 tons, opencast 229,400 tons): corresponding week of 1948· 4,320,700 tons (deep-mined 4,135,700 tons, opencast 185,000 tons).

More Fats, Less Sugar

Supplies of oils and fats from non-dollar sources will be substantially greater in 1950 than in 1949, says a Ministry of Food Press notice. It will be possible from the end of February to make some increase in the allocations of fat for certain food industries. Allocations of sugar for some manufacturing processes will be reduced as from January 1, 1949, to facilitate reduction of dollar imports.

Caustic Potash

A Press note from I.C.I., Ltd., referring to the Board of Trade decision to enable caustic potash and carbonate of potash to be dealt with by private trade from January 1 next, points out that the group's General Chemicals Division will have available supplies of caustic potash liquor (50 per cent alkalinity calculated as KOH) for those who are not accustomed to import solid grade.

Chemicals in the 1951 Festival

Described as the most striking building planned for the South Bank Exhibition of the Festival of Britain in 1951, the Dome of Discovery, a huge aluminium structure, 97 ft. high and 365 ft. in diameter, is to house a display devoted to physical and chemical research and its application to industry among other science exhibits. Chemicals and allied products will also be well represented.

Duty Exemption

A further exemption from Key Industry Duty of three chemical materials was announced this week. They affect crude bismuth oxychloride, crude cerium chloride and calcium citrate (fermentation) during the period November 24-December 31, 1949. The relevant order is S.I. 2123.

Food Ministry Factory

A Ministry of Food scheme to establish in Aberdeen an experimental factory for the full-scale processing of food under commercial conditions has been announced by Dr. Norman Wright, Scientific Adviser to the Ministry of Food. It is hoped the factory will help to bridge the gap between research and the application of its results.

Chemical Engineering Castings

The British Standards Institution has recently published British Standard 1591, covering the requirements for acid-resisting high silicon iron castings for chemical engineering purposes. The chemical composition of the castings and the procedure for chemical analysis are specified. Details are also provided relating to heat treatment, freedom from defects, porosity, repairs to castings, welding, marking and packing, inspection and testing facilities.

Lead and Zinc Cheaper

By two reductions since Monday last week, the Ministry of Supply price for good soft pig lead has been reduced to £97 per ton. The Ministry zinc price has also been reduced by £2 to £85 10s. per ton. These last reductions took effect on Wednesday this week. A rise of £1 15s. in the price of zinc oxide was announced on November 10. Red seal is now £82 5s., green seal £83 15s., and white seal £84 15s., per ton, delivered, for 2-ton lots.

Co-operative Research

In furtherance of its co-operative investigation programme, the Manchester Section of the Oil and Colour Chemists' Association is asking for volunteers willing to undertake the analytical work necessary in the determination of the non-volatile content of paint media. Offers to undertake such work are invited by the section's honorary research liaison officer, Mr. T. E. Johnson, John Mathews & Co., Ltd., Vauxhall Road, Liverpool 3, who will provide particulars of the work involved and apparatus required.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

NEW forms of Teflon tetrafluoroethylene resin have now been developed by E. I. Du Pont de Nemours & Company, which developed the original form of the plastic during the war. Evolution of the new forms, although they are not yet in commercial production, is regarded as being almost as important as the discovery of the plastic itself. Teflon has been difficult to fabricate and up to now it has only been possible to make the plastic by slow and costly methods in relatively simple shapes with limited industrial uses. Du Pont research recently established that Teflon could be made in a form in which fine particles of the plastic are suspended in a liquid. This led to useful developments—in procuring the adhesion of Teflon and metals and in spray finishes. Five new finished products will soon be available. They are: Industrial spray finishes which may serve to give chemical tanks corrosion-resistant linings; enamels for insulating fine wire which can be coated at a rate of about 50 ft. a minute; compounds for extruding heavier insulation for wire at rates up to 20 ft. a minute; unsupported Teflon film in thinner gauges; and coated glass fabrics. The plastic will resist the attack of nearly all chemicals up to 500°F. Teflon insulation may make it possible to raise power capacities of electric motors without increasing size. These suspensions will cost approximately $10 per lb. of solid content.

* * *

A new ultra-sensitive method for rapidly detecting the presence of small quantities of hydrogen sulphide in gases is being used successfully in research at the U.S. Bureau of Mines Synthesis Gas Production Laboratory at Morgantown, West Virginia. It has been applied to the study of the purification necessary to meet the rigorous standards for gas used in the Fischer-Tropsch synthesis of liquid fuels. Using methylene blue as the indicator, the process detects concentrations of as little as 1/1000 g. of hydrogen sulphide in 100 cu. ft. of gas using a cubic-foot sample and duplicates the results with a high degree of accuracy on identical samples. The normal maximum tolerance in synthesis gas is 1/10 g. of sulphur per 100 cu. ft. of gas. In modifying previously tested methods using methylene blue as the indicator for hydrogen sulphide, a photoelectric colorimeter and a spectrometer were used. A suggested test procedure including the preparation of reagents is given in the bureau report.

* * *

A new lead alloy for use in the chromium plating industry, called "Nalco," has been introduced by the National Lead Company, New York. Designed to furnish considerably longer service, "Nalco" is used for tank linings, anodes, and heating-and-cooling coils, and is said to be substantially more resistant to the corrosive and pitting action of chromic acid solutions.

* * *

Methods to prevent pollution of the atmosphere are usually costly, but have occasionally proved capable of yielding profitable returns, in addition to the indirect benefits. The Detroit Edison Co. spent several hundred thousand dollars on equipment to collect the solid emission from its smoke stacks and is now selling the ash at a substantial profit, according to Weldon B. Gibson, Stanford University Research Institute, in his address to the first National Air Pollution symposium, Pasadena, California. Other instances cited by the speaker, were a Los Angeles firm which in return for its expenditure of $40,000 on equipment was now recovering daily $300 worth of lead oxide which formerly went to waste, and another company which was now selling $15,000 worth of sodium sulphate a month as reward for an investment of $125,000 on purification plant.

* * *

The U.S. Atomic Energy Commission has disclosed that its raw materials operations manager, Dr. J. K. Gustafson, is now in South Africa to survey prospects for mining uranium in the gold fields there. In Johannesburg Dr. Gustafson is conferring with British and South African Government officials. It is known that uranium had been found as a very minor constituent of some South African gold ores and there is a prospect that uranium could be mined as a gold by-product. The American Atomic Energy Commission at present depends upon supplies from the Belgian Congo and Northern Canada. In Canada, Dr. C. J. Mackenzie, chairman of the Atomic Energy Control Board, told the national Atomic Committee that the bulk of Canada's uranium goes to the U.S.A. for bomb production.

• OVERSEAS •

Aluminium Hydroxide for Argentina

Imports of aluminium hydroxide into the Argentine will in future be free from import duties if intended for the manufacture of certain vaccines, states *Reuter*.

No Bids for German Patents

The Swedish Foreign Capital Control Office states that it has received no bid for the 34 patents, formerly German-owned, offered for sale. Some inquiries had been received from Great Britain. The period for accepting bids has been extended.

Raising Copper Output

The Chilean Government has announced that the Chile Exploration Company has undertaken to raise the production of copper at its Chuquicamata mine by 20 per cent—from 25 million to 30 million lb. monthly—owing to increased consumption needs in the U.S.A.

Australia to Make Cellulose Acetate

A new plant, estimated to cost about £2.25 million, is now under construction in New South Wales for the production of cellulose acetates by C.S.R. Chemicals, Ltd., a subsidiary of the Colonial Sugar Refinery Group. It is hoped eventually to meet the requirements of Australia's plastic manufacturers and also to produce a number of organic chemicals at present imported.

U.S. Aluminium Output

Production of primary aluminium in the U.S.A. in August was 52,005 short tons, a drop of 7 per cent. The average daily rate of production was the lowest for over a year, and August was the first month of this year in which output did not exceed the corresponding month of 1948. Market conditions improved, shipments from reduction plants totalling 57,403 tons, and stocks began to decrease.

Scientific Research in Hyderabad

The foundation stone of a new centre of scientific and industrial research, similar to the Indian national laboratories now being set up, was laid recently by the military governor of Hyderabad, Major-General J. N. Choudhury. Research in the laboratory will be both of a fundamental and applied nature, aiming, in particular, at the promotion of the chemical industries, and technical development and utilisation of local materials. The State of Hyderabad is known to be particularly rich in oil, coal and clays.

Italy Exports Fertilisers

During the first half of this year Italy exported fertilisers of a total value of L.3,063 million and imported only L.867 million. Before the war, Italy exported no fertilisers.

Dutch Instruments Company

The firm of Landys & Gyr, of Zug, Switzerland, is to establish a subsidiary company in Waalwijk, Holland, with an initial capital of fl.500,000, to make metallurgical, mechanical, electro-technical and thermic apparatus.

Canadian Titanium Ore

Titanium bearing iron ore deposits in the Lake Tio district in Quebec, operated by the Iron & Titanium Corporation, are expected to be in production within two years. The 27-mile railway from Havre St. Pierre to the deposits is now nearing completion. Ore will be smelted at Sorel, about 30 miles down the St. Lawrence from Montreal.

Norway's Rising Coal Total

Reports from Norway indicate that in spite of the almost complete destruction during the war of the Norwegian-owned coal mines in Spitzbergen, output for the current year is estimated at 400,000 metric tons against 300,000 tons in 1938. A further increase in output will depend on finding new uses for coal, possibly for the production of synthetic petrol for foreign markets.

Synthetic Rubber Preferred

Synthetic rubber roller coverings are now being used for spindles in the Australian textile industry in increasing numbers. Attempts to utilise natural rubber have not been successful because of its antipathy to oil. The synthetic coverings are replacing leather and cork, and in the woollen ring spinning frames approximately 98 per cent of the spindles are so equipped.

Synthetic Wax for Coatings

A new synthetic wax, Ceramid, an alkyl stearamide, is now being produced in commercial quantities in the U.S.A. Chemically, it is hard, light yellow in colour and melts between 79.5°-80.5° C. It is insoluble in water and is more soluble in organic solvents than natural and other commercial synthetic waxes. Its most promising use is for protective coatings and films deposited out of a solvent solution.

Next Week's Events

MONDAY, NOVEMBER 28

The Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. (With Woolwich Polytechnic Scientific Society). A. C. Monkhouse: "The Minor Constituents of Coal."

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. "Ventilation and Dust Extraction."

TUESDAY, NOVEMBER 29

Society of Instrument Technology

London: Manson House, Portland Place, 7 p.m. G. Russon and P. Rodicq: "Development of Instrumentation on the Martin Open Hearth Furnace in France."

Society of Public Analysts and Other Analytical Chemists

London. Imperial College of Science and Technology, South Kensington, S.W.7, 6 p.m. (Physical Methods Group). Fifth annual general meeting, followed by lecture. Dr. J. G. A. Griffiths: "The Mass Spectrometer, a Survey of its Applications in Analysis."

WEDNESDAY, NOVEMBER 30

The Chemical Society

Cardiff. University College, 7 p.m. Dr. G. Gee: "Some Recent Advances in the Physical Chemistry of High Polymers."

The Royal Society

London: Burlington House, Piccadilly, W.1, 2.30 p.m. Anniversary meeting.

Royal Society of Arts

London: John Adam Street, Adelphi W.C.2, 2.30 p.m. H. Moore (Professor of Glass Technology, Sheffield University) and L. H. A. Pilkington: "Recent Advances in the Manufacture of Plate and Sheet Glass."

British Association of Chemists

London: Welcome Research Institution, 183 Euston Road, N.W.1, 7 p.m. Dr. E. Sunderland: "A New Method of Synthesising Resins and Plasticisers."

THURSDAY, DECEMBER 1

The Chemical Society

Nottingham: University, 6.30 p.m. (With Nottingham University Chemical Society). Original papers.

Sheffield: University, 5.30 p.m. (With Sheffield University Chemical Society). Dr. W. A. Waters: "Some Oxidations Involving Free Radicals."

FRIDAY, DECEMBER 2

The Chemical Society

Birmingham: University, Edgbaston, 6.30 p.m. (With Birmingham University Chemical Society). Dr. W. A. Sexton: "Chemical Constitution and Biological Activity."

Manchester: Gas showrooms, Town Hall Extension, 6.15 p.m. (With RIC and SCI). Prof. M. G. Evans: "Some Studies of Oxidation-Reduction Reactions."

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m.. (Industrial Spectroscopy Group). Dr. A. G. Gaydon (Imperial College of Science and Technology). "Recent Developments in the Spectroscopic Study of Combustion Processes."

Ramsay Chemical Dinner

Glasgow. Beresford Hotel, 6.45 p.m.

SATURDAY, DECEMBER 3

British Interplanetary Society

London: Lecture theatre, Science Museum, South Kensington, S.W.7, 6 p.m. Film display. "Operation Backfire" and "Atomic Physics."

Fluorine Chemistry Symposium

DEVELOPMENTS in fluorine chemistry will be discussed at a meeting organised by the Chemical Society at the Royal Institution, Albemarle Street, London, on Wednesday next.

Professor H. J. Emeléus has arranged the symposium which will be held in two sessions beginning at 2.30 p.m. and 8 p.m.

In the afternoon, papers for discussion will be as follows. A. J. Rudge (I.C.I. General Chemicals, Widnes): "The Production of Fluorine"; R. le G. Burnett and A. A. Banks (I.C.I. General Chemicals, Widnes): "The Preparation and Properties of Chlorine Trifluoride"; H. J. Emeléus, A. G. Sharpe and A. A. Woolf (Cambridge): "Bromine Trifluoride as an Ionising Solvent"; M. G. Evans, E. Warhurst and M. Whittle (Manchester): "The Bond Dissociation Energy of Fluorine"; M. G. Evans and E. Warhurst (Manchester): "The Reaction of Fluorine Compounds with Sodium Atoms"; and M. Stacey (Birmingham): "Synthesis and Significance of Fluorocarbons."

Two further papers will be given in the evening, "Some Reactions of Trifluoromethyl Iodide and Pentafluoroethyl Iodide," by Miss J. Banus (Cambridge) and "Trifluoroacetic Acid and its derivatives," by J. C. Tatlow (Birmingham).

SPANISH AGRICULTURAL CHEMICALS

Large Increases of Home Production Proposed

ONE of the most comprehensive studies of Spanish needs of fertilisers and agricultural chemicals in general, with detailed proposals for the home production of some of the former, is the report which has been presented to the Spanish Syndical Council. The principal features of this report have been presented in *ION* (1949, August, September, 461-4, 473-6, 523-528).

The urgent problem in Spain is to increase agricultural production. Three basic factors are involved: agricultural machinery and transport, fertilisers and anticryptogams, and improved selected seed. The second of these factors is considered in detail under two sections or phases, the first of which relates to the actual present position as to supply and demand; and the second, to possibilities of extension to the level desired.

Considering first nitrogenous fertilisers, the present demand is estimated at 140,000 metric tons of nitrates of soda and lime, and 360,000 tons of ammonium sulphate or its equivalents, or a total, in terms of nitrogen, of 93,000 tons. (All tonnages quoted are metric tons.) Only 6.8 per cent of this was produced at home, so that the greater part has to be imported.

Small Imports

Imports have, however, been entirely inadequate, totalling only 152.330 tons of sulphate and nitrates in 1948 (90,000 tons nitrate). The principal firms contributing to the small home production are: Energia e Indust. Aragonesas S.A., Soc. Iber. del Nitrogeno, Soc. Electroquim. de Flix, whose activities are described in some detail, together with a comparison of prices of home and imported fertiliser. Consideration of respective prices of ammonia and ammonium sulphate shows that it has been much more profitable to sell ammonia as such than convert it to sulphate. Imported ammonium sulphate, mostly English, has commanded higher prices than home-produced, namely, at £25 per ton or 1500 pes. in the Spanish market, as compared with 1200 pes. for the home product. Spanish factories mentioned are by no means working to capacity which is 14.500 tons of nitrogen, while actual output is only 6500 tons. Among measures proposed to remedy the position is that of subsidising or otherwise assisting the home industry, so that the prices obtained are equal to, or higher, than those of imports; or a greater tariff on the foreign material.

Consumption of phosphates, mainly in the form of superphosphate, has fluctuated widely during the past 20 years, reaching just over 1 million tons yearly during 1927-1935, falling to 200,000 tons during the Civil War. In 1947, 365,000 tons was consumed and, in 1948, 710,000 tons.

Natural Phosphates

Quantities of other phosphate, such as natural phosphates and basic slag, are almost negligible, about 7000 tons each in 1935—the latest figures available. Total national capacity is said to be, for 35 factories, 1.75 million tons, but actual output would appear to be far below this, and various measures are proposed to increase it, including larger and cheaper supplies of lead (for sulphuric acid), sodium nitrate, cheaper power and transport, etc., also stricter control of imports, and some alleviation in transport charges.

Consumption of potash in Spain is given only for the years prior to the Civil War, when it was about 24,000 tons in terms of K_2O. Production of potassium sulphate fell from 2164 tons in 1945 to 1498 tons in 1948. Output of potassium chloride in terms of K_2O in 1948 was 165,000 tons. Potash fertilisers are therefore considered to be in sufficient supply.

In regard to pest control chemicals, use of copper sulphate in Spain in 1935 required 15,500 tons, and consumption is estimated to be about the same now. Total capacity of the many companies making pesticides is said to exceed home demand.

Principal firms are S. A. Cros, of Badalona and other places; Vicente Ros, of Martorell; Indust. Quim. del Valles, of Mollest; Fab. Quim. S.A., Valencia; Union Española de Explosivos, Madrid (Cerro de la Plata), and of Sevilla; Soc. M & M. de Peñarroya; and Cia. Navarra de Abonos Quimicos, of Pamplona.

A common difficulty in recent years has been in connection with supplies of copper, and sulphate production has suffered accordingly. From 10,000 tons (of copper used) in 1946, it fell to 4000 tons (estimated) for 1949. Production in 1948 was slightly less.

The production of sulphur in Spain, to meet an annual consumption of 25,000 tons, both in the natural state and from pyrites, is said to permit a margin for export. The yield of natural sulphur has greatly declined, and the main source would appear to be pyrites. The Rio Tinto mines also seem to be a declining source, although, in 1948, they accounted for 90 per cent of a total sulphur production of 31,000 tons. It is thought that the best solution of the problem is the recovery of sulphur by a new method from the sulphides of zinc, or other sulphides, of which there are large deposits in Hinojedo-Torrelaguna (Santander) belonging to the Real Compañía Asturiana de Minas (Royal Asturian Mining Co.). This company has installed new plant for roasting the ores, recovering sulphur initially at a rate of 20,000 tons annually, with possibility of increase.

Need of Fertilisers

Spain is said to have almost the worst fertilised agriculture in Europe. The vast possibilities of increased use of fertiliser are reported to the Syndical Council in this form:—

	Present consumption	*Potential consumption*
	in 1000	*metric tons*
Phosphates	875	4347
Potash	48	600
Nitrogenous	404	1450

Increase in yields per hectare (in metric quintals of about 2 cwt.) of the principal crops in Spain, by adequate use of fertilisers is estimated thus: wheat 3, barley 4, maize 5, roots and potatoes 60, pastures and leguminous forage crops 8, other legumes (peas and beans) 2, olive plantations 5, and vineyards 8.

Areas of these crops in 1000 hectares are: wheat 3586.6, barley 1523.8, maize 352.8, roots, etc., 508.3, pastures, etc., 191, peas and beans 1057, olives 2166, vineyards 1501. Increased values of crops by adequate fertilising would therefore total about 8533.4 million pesetas, at current prices.

This does not include possible extension of cultivated acreage through irrigation or other means, which is discussed in some detail. And nothing is said about area under oranges or other fruit and vegetables. The extent of irrigated lands in Spain at present is about 1.45 million hectares, and plans have been approved which would approximately double this. (Inst. Nac. de Colonización.) Even with a minimum allocation of nitrogenous fertiliser to cultivated land at present available the total demand in terms of nitrogen could well be raised to 320,000 metric tons annually.

Considering next the possibilities of increasing home production, two firms at least hope to enlarge their output within the next year or two. Soc. Iber. del Nitrogeno has a new plant completed or nearly so, and by 1952 should have a capacity augmented by 9000 tons of nitrogen. Energia e Indust. Aragonesas is also installing new plant at Sabiñánego (Huesca) for 3780 tons of nitrogen (18,000 tons of ammonium sulphate) by 1951, to employ the additional power from the new electric power station at La Sarra y Sallent (120 million kWh per annum).

New plant is also being installed by Setanitro, which hopes to produce 120,000 tons of ammonium sulphate yearly by 1951. Hidronitro Española at Monzon (Huesca) will obtain nitrogen by fractionation and will by 1951 be producing 6100 tons of nitrogen (as cyanamide) and 6600 tons as ammonia. Nitratoa de Castilla, S.A., will produce at Vallodolid ammonia by electrolytic methods, yielding ultimately some 64,000 tons of calcium nitrate.

Many of these new enterprises are having difficulty in securing plant. This applies to the Cia. Españ. del Azoe, which plans for 6000 tons of nitrogen yearly, and to the I.N.I., whose new factory at Escatron may yield 150,000 tons of ammonium sulphate, from lignite gas, while another at Puertollana may afford 40,000 tons of ammonium sulphate and 16,000 tons of calcium nitrate, and a third at Puentes de Garcia Rodriguez 30,000 tons of ammonium nitrate.

New Projects

Most of these new projects have been delayed. Thus the Soc. Iber. de Nitrogeno needs cement, iron and steel, and machinery; and most of the others urgently want machinery, the cost of which has been calculated in various currencies.

In these Spanish estimates of requirements up to 1952 little change in demand for phosphates and potash is foreseen, although the extensive irrigation plans are capable of affecting these also.

Nor is copper sulphate considered in this second national development-survey. For sulphur, the Royal Asturian Mining Co., as stated, is installing plant, and proposes to use the Trail (Canada) process of the Consolidated Mining & Smelting Co., Ltd., for concentration of SO_2 and its reduction to sulphur. It is proposed to import the reduction plant and manufacture the concentration plant in Spain. Total demand, including industrial uses, is more than 50,000 tons.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MERTHYR TYDFIL CERAMICS, LTD., Cardiff. (M., 26/11/49.) October 26, deb. (referred to in the agreement dated August 12 and reg. August 17, 1949), to H.M. Treasury Solicitor securing £75,000 (not ex.); charged on specified lands at Merthyr Tydfil, and a general charge.

SECOMASTIC, LTD., London, W, manufacturers of jointing compound. (M., 26/11/49). October 26, £2500 (not ex.) charge, to Lloyds Bank, Ltd.; charge on leasehold factory premises at Power Road, Chiswick. *——. January 13, 1949.

VITREOUS ENAMELLING INDUSTRIES (BRADFORD), LTD. (M., 26/11/49.) October 25, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land and buildings known as Alexandra Shed, Parsonage Road, Laisterdyke, Bradford. £7697. August 2, 1948.

Satisfaction

VITREOUS ENAMELLING INDUSTRIES (BRADFORD), LTD. (M.S., 26/11/49.) Satisfaction October 28, of mortgage reg. September 26, 1946.

Increases of Capital

The following increases in registered capital have been announced: MONCKTON COKE & CHEMICAL CO., LTD., from £170,000 to £210,000. EAGLESCLIFFE CHEMICAL CO., LTD., from £150,000 to £250,000.

New Registrations

County Lime Co., Ltd.

Private company. (475,017). Capital £4000. Manufacturers of agricultural lime, fertilisers, chemical manures, etc. Directors: J. C. Allen, R. S. Smith. Reg. office: 3 Cambray Place, Cheltenham.

Universal Solvents (Brighton), Ltd.

Private company. (474,851). Capital £1000. Manufacturers of liquid and other soaps, bleaches, ammonia and other scouring and bleaching materials, etc. Directors: M. B. Morley, E. P. A. Smith, K. T. Gibbon. Reg. office: 56 Shirley Street, Hove 3.

Cement and Manganese

THE annual report of Pretoria Portland Cement Co., Ltd., states that clinker production started at the new factory at Orkney in July, and cement production in August. The time for the completion of the extensions at Slurry still depends on the delivery of certain plant and equipment due in the latter half of the year. Deliveries of new plant ordered for the expansion of the Eastern Province Cement Co., Ltd., have been disappointing, and work in this connection is likely to be delayed. It is hoped, however, to start production at the new plant of the Premier Portland Cement Co. (Rhodesia), Ltd., during the latter half of the year. Imports of cement were continued by the Rhodesian Government. The company's last annual profits increased from £413,603 to £501,733 after providing £110,109 for taxation.

A Brazilian report states that the surface deposits of manganese, having a metallic content of about 55 per cent. discovered several years ago in the Serra do Navio region of the Federal Territory of Amapá, may afford approximately 10 million tons of ore. Although the extraction would present little difficulty, the comparative inaccessibility of the deposits raises a transport problem, requiring the building of a 200 km. railway to a point on the River Amazon where suitable deep-water loading facilities could be developed. The railway would cost about Cr$150 million, and construction of the river port would require a further Cr$7,500,000.

Reduced Profit

Union Chimique Belge, Brussels, reports for the financial year to June a slightly reduced gross profit of B.fr.114.5 m. (117.2 m.). Net profits totalled B.fr.49.2 m. against 52.5 m. A net dividend of B.fr.50 (30) is to be paid on the share capital.

Chemical and Allied Stocks and Shares

HELPED by Sir Stafford Cripps's latest review of financial and economic conditions, British Funds maintained their rally, and markets generally have been steadier. Caution remained the keynote, with a tendency to await the result of the £10 million South Africa loan. No further evidence has been given of official support for gilt-edged by the Government broker, but it is assumed generally that the authorities are determined to prevent long-dated British Funds going to a higher yield basis than 4 per cent.

Leading industrial shares rallied with gilt-edged, and chemical and kindred shares also benefited, being better on balance, although the best levels reached were not fully maintained.

Imperial Chemical were 42s. 9d., after touching 43s. 6d. and now yield 4⅝ per cent on the basis of last year's 10 per cent dividend. Monsanto changed hands around 50s., Fisons were 27s. 9d., Albright & Wilson 5s. shares 30s., Amber Chemical 2s. shares 4s. 3d., and F. W. Berk 2s. 6d. shares showed activity around 13s. Elsewhere, Bowman Chemical were 6s. 9d., and Brotherton 19s. 3d., with Calor Gas at 17s., Pest Control 8s. 1½d., and Boake Roberts easier at 27s. 6d. British Chemical & Biologicals 4 per cent preference were 18s. 9d., and L. B. Holliday 4½ per cent preference 19s. 9d.

Glaxo Laboratories at £21 have been a good feature on the full results and chairman's annual statement, which emphasised the good earning power and financial strength. Even after provision for the share bonus, remaining reserves will equal one and a half times the increased issued capital. In other directions, British Xylonite have been steadier at 53s. 9d., British Glues & Chemicals 4s. shares were 17s., British Industrial Plastics 2s. shares better at 5s., with De La Rue 23s. 9d., and Erinoid easier at 5s. 9d.

Elsewhere, Staveley were well maintained at 78s. 3d., and Laporte Chemicals 5s. ordinary 9s. 6d., with Lawes Chemical 10s. shares at 9s. 6d. xd.

Iron and steels moved higher, encouraged by the fact that nationalisation cannot now take place until January 1, 1951, at the earliest. United Steel were 28s., Dorman Long rose to 31s. 6d., helped by the big profit increase for the past financial year; while Hadfields were 27s. 3d., Stewarts & Lloyds 52s. 9d., Beardmore 44s. 9d., and Colvilles 34s. 7½d. Elsewhere, Guest Keen were 40s. 3d., Babcock & Wilcox 59s., and Firth Brown 70s. 1½d.

Turner & Newall at 74s. 6d. responded to the rally in industrials, and United Molasses have been active up to 38s. on the company's further expansion in shipping activities indicated by the offer to acquire control of Anchor Line.

British Aluminium have been more active up to 41s. 3d. on the assumption that the company may find more scope following reduced aluminium supplies from Canada which will result from the need to save dollars. Amalgamated Metal shares at 17s. 9d. have been unaffected by the re-opening of the London Metal Exchange for dealing in tin. There is talk that free dealings in copper may be restarted early next year.

Boots Drug showed more activity around 48s. 9d., British Drug 5s. shares were 6s. 6d., Sangers 22s. 1½d., and Beechams deferred 14s. 9d. After rising to 62s. 9d., Dunlop Rubber came back to 61s. 9d. Tube Investments were firmer on the full report and accounts, changing hands at slightly below £5¾. Borax Consolidated remained a firm feature at 58s. Oil shares failed to hold all earlier gains, Shell being 69s. 4½d., and Anglo-Iranian £7⅛.

Ultramar Oil shares have fluctuated between 7s. 6d. and 8s. 3d. awaiting news of the outcome of the company's negotiations to obtain additional capital.

£4 Million for Cellulose and Acid

A/S BORREGAARD, the Norwegian company manufacturing cellulose acetate, acids, etc., and employing 10,000 workers at its factories in Norway, Sweden and Austria, has decided to increase its share capital from the equivalent of £3.75 million to £5 million to carry out expansion plans costing an estimated £4 million. New plant for the annual production of 90,000 tons of cellulose is to be built at Sarpsborg, Norway. A second plant there will produce 3000 tons of cellulose wool yarn a year, and another is to concentrate on cellulose acetate, acetate silk, acetate foil and plastic powder. A fourth is designed to produce at least 15,000 tons of sulphuric acid annually.

In Austria, where modernisation is also planned, the company's two factories have a total yearly capacity of 50,000 tons of bleached cellulose, 7000 tons of fine paper and 5 million litres of spirit. A/S Borregaard's external sales last year amounted to £15 million.

Prices of British Chemical Products

Steady Demand Largely Met by Supplies

TRADING conditions on the industrial chemicals market are continuing along satisfactory lines with the demand from home users well maintained, both as regards delivery specifications and the placing of new business. There is also a fair weight of fresh inquiry for export in evidence. So far as values are concerned, the undertone is very firm. A steady demand persists for most of the soda compounds and the potash chemicals remain firm. Formaldehyde is in good call, while both hydrogen peroxide and bleaching powder are receiving a fair amount of attention. All grades of borax and boric acid are meeting with a fair inquiry and a good demand is reported for the non-ferrous metal products. In this market there has been a further reduction in red and white lead prices owing to a decrease in the controlled price of the metal. The new basis price for white lead is £127 15s. per ton and the new basis price for red lead £119 10s. per ton. Brighter conditions continue to prevail on the coal tar products market, buyers taking rather more interest than of late.

MANCHESTER.—Firm price conditions have been reported in most sections of the Manchester chemical market and trading has been fairly active in a wide range of products Textile chemicals are being taken up in good quantities in Lancashire and the West Riding of Yorkshire and there is steady pressure for deliveries under contracts from the rubber, paint and other principal using trades. Replacement buying during the week has been fairly brisk on home trade account and additional inquiries have been circulating from shippers.

GLASGOW.—All classes of chemicals have been fairly well taken up in the Scottish chemical market during the past week. The shortage of Glauber salts, commercial and desiccated, continues, and there is no doubt that the position has been worse this year than previously. Indications are that there is a continuing increase in consumption of this prodcct in Scotland and little or no additional productive capacity. An increasing interest is being shown in sodium chlorate for bleaching purposes.

Price Changes

Rises: Acetic anhydride, arsenic, copper sulphate, zinc oxide, cotton acid oil.

Reductions: Red lead, orange lead. white lead, Empire stearine.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50 000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d, to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags, commercial, granular, £36; crystal, £38; powder, £39; extra fine powder, £40; B.P., granular, £45; crystal, £47-£48; powder, £48-£48 10s.; extra fine powder, £49-£49 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £64 10s.; crystal, £70; powder, £67 10s.; extra fine powder, £69 10s.; B.P., granular, £76 10s.-£79 15s.; crystal, £82; powder, £79 10s.-£81 15s.; extra fine powder, £81 10s.-£83 15s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 9½d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £119 10s., orange lead, £131 10s. Ground in oil: red, £140 10s., orange, £152 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £127 15s. per ton, Ground in oil, English, under two tons, £146 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£119 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £84 15s.: green seal, £83 15s.; red seal, £82 5s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December, £10 3s. 6d., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 16s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.: nitration grade, 2s. 10¼d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra: higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: November 23. Unrefined, per ton, naked ex works, cotton acid oil £94. The price of all other unrefined oils and fats remains the same until December 3. Refined, per ton c.i.f., Empire stearine, in soft wood barrels, £117 15s.; in casks or drums, £116; in hardwood barrels, £121 15s. Other refined oil prices are unchanged during the 8-week period ending December 31.

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U.S. MINERALS

Some Record Tonnages

A GENERAL survey of the mineral industry in 1948 is contained in the market reports just issued by the Bureau of Mines, United States Department of the Interior.

Sales of bromine compounds by primary producers in 1948 totalled 90,338,555 lb. gross weight, which was a slight reduction on the previous year, but well above the figure for 1946. The bulk of the bromine sold was in the compound ethylene dibromide for use in gasoline anti-knock compounds.

Tonnages of both caustic-calcined and refractory grades of magnesia, sold or used by producers, were appreciably greater in 1948 than in the previous year. Caustic-calcined sales reached 33,209 short tons, while a new record of 330,069 short tons was established by sales of refractory magnesia. Output of crude magnesite in 1948 cannot be published as this would reveal the production of individual companies.

A steady increase has marked the production of calcium chloride (and calcium-magnesium chloride) from natural brines over the past five years. Total output for 1948 set up a new record of 301,936 short tons, an increase of 30,730 tons over 1947, and 100,972 tons more than in 1944.

Boron minerals in 1948 showed a decrease in domestic production of approximately 10 per cent compared with 1947. The total output of 450,932 short tons containing 134,700 tons of boron trioxide, was higher than in 1946 and the two previous years.

The serious shortage of alkalis which has existed for several years continued into the first part of 1948. In the latter part of the year, however, demand lessened and completion of most of the expansion programmes in the industry brought about a state of local over-supply to the market.

Sales of natural sodium carbonate totalled 288,769 short tons, natural sodium sulphate sales attaining a level of 265,862 short tons.

Works Fatalities

A VERDICT of accidental death, due to being caught under the guides of a hopper while stepping over a conveyor belt, was returned at the inquest, at Northwich, on Norman Evans, aged 40, chemical labourer, of Chapel Lane, Moulton, who died at the I.C.I. Lostock works, Northwich, after his chest had been pressed so hard against the moving band that he could not breathe. Mr. J. R. Allen, manager of the works, said his theory was that Evans' right foot slipped when he was stepping over the moving belt to clean up lime on the other side and that he must have winded himself or been knocked unconscious when he fell on the belt. Instructions had now been given to the men that they must not step over the band and the firm was seeking a new method of collecting the lime, so as to make it unnecessary for the men to go to the opposite side of the belt.

Mr. George Mills, aged 63, of David Street, Northwich, died in the Victoria Infirmary from severe burns received while at work at the Winnington plant of I.C.I., Ltd.

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Equipping the Petroleum Industry

THE allocation of $6.5 million by ECA for the equipment of Grangemouth is a measure of the importance attached in American estimation to the development of Britain's petroleum derivatives industry and, indirectly, of this country's increased ability in a new engineering field. The whittling of the sum originally estimated to be required—$9 million—takes account of the fact that Britain can supply more plant than was first thought possible. The knowledge that a substantial proportion of that advance will return to the U.S.A. in payment for some forms of oil plant does not diminish the value of that assistance towards meeting the imperative need to cut this country's dollar needs. The rapid progress of the petroleum industry is producing the gradual expansion of production of plant and equipment for refineries, which are becoming progressively less dependent on overseas sources of supply. In the United States the large home market has enabled plant manufacturers to concentrate on specialist lines, while very close co-operation has existed between the petroleum industry and its suppliers. These conditions have given America a very long lead in the design and production of petroleum plant.

When refineries were started in Britain the companies responsible for these developments had the fairly full collaboration of American associates. British manufacturers had already supplied a fairly large quantity of equipment to the Middle East, but their experience in this direction had been on a fabricative rather than a design and " know how " basis. The tendency, therefore, was to have specialised refinery equipment for Britain built in the United States and shipped to this country for installation. Today the position is changing. Not only have British firms entered the field, but some of the large American concerns, well established in the United Kingdom, are employing British fabricators both for their United Kingdom and export requirements, so that there is no longer quite the same necessity for importing large quantities of equipment from the U.S.A. Some British firms have gone into this new field on an extensive scale, with conspicuous success.

It is not unreasonable or unduly optimistic to conclude that Britain is in process of becoming to an important extent independent in oil refining installations and petroleum-chemical processing equipment of overseas sources of supply, although the petroleum industry must continue to rely on Ameri-

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can technology for some time to come. British manufacturers' present inability to supply certain specialised machinery on a competitive basis results, of course, from the position in the past that limited demand, as compared with that in the United States, has made it impossible to standardise on such equipment.

Beyond doubt, the chemical plant manufacturing industry in Britain is very different from its counterpart during the war. It has gained considerable confidence, has enormously expanded both the quantity and variety of its products, and is doing a job of conspicuous and immediate value. Not only is it playing a very large part in the re-equipment and expansion of the British chemical industries, but it has greatly expanded its export trade. Overseas sales today range from complete plants down to quite small units and some extremely large contracts have been secured. The new home industry, notably at Grangemouth, Stanlow and Fawley, affords a stable nucleus of all this.

Reports from the industry show that, while the labour force has gradually been built up to a fairly satisfactory level, there still remains a rather serious gap in the higher ranks, notably in the drawing offices. Once a plant has been designed the rest is largely a matter of mechanical engineering, but for the drawing office men with specialised training and knowledge are required. Throughout the engineering industries draughtsmen have become chronically scarce owing to the increased demand, and the problem has been complicated by the wastage during the war, when men abandoned the drawing office for managerial jobs which they now have no wish to leave. The expansion of petroleum processing equally is being hampered by the scarcity of good chemical plant draughtsmen. There is also the familiar shortage of chemical engineers, but the industry has been assisted in this want by the F.E.T.S. courses in chemical engineering. Raw materials are gradually increasing, although there remain some deficiencies, such as of certain thicknesses of mild steel plate.

Generally, it can be said that shortages of technicians and materials, rather than of markets, have become the principal factors limiting the expansion of petroleum equipment engineering. Once these difficulties have been overcome British manufacturers may find fresh scope on a scale seldom equalled in today's markets.

Notes and Comments

Science and the Festival

APPREHENSION that next year's Festival of Britain, in particular the South Bank exhibition in which scientific achievement is to form one of the keynotes, might be weakened by division on political grounds has been allayed by the FBI spokesman, Sir Frederick Bain, one of the festival council, and by the character of some others who will collaborate as advisers, among them Sir Robert Robinson, P.R.S. Reinforcing the answer given by Mr. Hartland Thomas, a member of the presentation panel, at a discussion with the technical Press last week that the council had met with no reluctance to participate fully on the part of either industrialists or scientists, Sir Frederick Bain said there were no grounds for anticipating anything in the nature of a boycot from any section of industry. The Council of Industrial Design, which is largely responsible for the presentation of exhibits selected, makes it clear that this will not be a trade fair, such as the BIF, where industries or businesses can buy display spaces. " A subject qualifying for inclusion must be one in which the British contribution is outstanding—such as an invention like penicillin or the jet engine." In elaboration of this principle, Mr. Hartland Thomas said that manufactures will not be selected; they will select themselves. They must also be illustrative of a particular aspect of the story of British industry. Prestige advertising of a national, but not of a political character would be the keynote of the exhibition and visitors from abroad would be able to follow the development of our industries since their pioneering days. These assurances are welcome and were necessary. Such heavy expenditure at a critical stage in economic affairs of the outcome were anything less than the title of the exhibition claims.

Water Softening Economics

COUNTRY-WIDE water softening would be a boon to nearly everyone—except perhaps the makers of small-scale softening apparatus—and would fairly certainly repay the very great expenditure by savings in industry and the home. That not altogether arresting conclusion appears to be one of the more tangible results of the painstaking investigations which have been carried on since July, 1946, by a sub-committee of the Central Advisory Water Committee under Lord Walkden's chairmanship. That may appear somewhat obvious; it is certainly more self-evident than the supporting data which this committee has been able to muster from all sources and which are going some day to serve a very useful purpose when country-wide water softening becomes a practicable project. Behind the perfect impartiality with which this report has been prepared is the unexpressed conviction that the ideal of soft water wherever it is lacking in this country—and 45 per cent of the population is computed to be making the best of a hard or very hard supply—is not likely to be realised in present economic conditions. Meanwhile, all the evidence that is needed for the presentation of a good case when the happy moment arrives has now been put on record. Some of it is necessarily not very precise, but is none the less arresting: the estimates that soap waste per person, due to hard water, averages 8.9 lb. (8s. 2d.) yearly and damage to fabrics 10s. Central softening by base exchange, to 200 p.p.m. of hardness, might cost no more than 4d. per 1000 gal., that is about 4s. per head of the population per annum. Even disregarding the saving to industries which do not have their own softening resources (the report does not), the supply of soft water by the mains would be as economical as it would be welcome. But that is not imminent.

Gift of Cortisone

FEW better instances can be looked for of the genuineness of the impulse in some sections of science and technology in the U.S.A. to share some of their advantages than the news of America's impending gift for the use of British research of a small quantity of cortisone, the new "Compound E" which has produced some arresting results in the treatment of rheumatic diseases. It may be assumed that one of the most deserving claimants to some of this specimen material, indispensable to those seeking to provide by synthesis an equivalent procurable in useful quantities, will be the Dyson Perrins Laboratory at Oxford University, where Sir Robert Robinson is to direct the programme of cortisone synthesis research, towards which the Nuffield Foundation has offered the gift of £10,000, spread over three years. The motive of the Oxford undertaking transcends the commercial incentives, but few onlookers can overlook the very attractive rewards which are offered in most of the markets of the world for the newer products of biochemistry research, of which an appreciable supply of any material which could be reliably used to hold in check the crippling effects of arthritis would receive a very large share. That is shown by some of the commercial figures relating to penicillin, of which one producer, Glaxo Laboratories, which is far from enjoying a monopoly, gives some indication. Aggregate overseas turnover of that organisation, not exclusively of penicillin, of course, has doubled in the past two years and is ten times as large as it was pre-war. Total export sales of U.K. penicillin in ten months this year realised £2,139,555 (£1.67 million in the same period of 1948). Research and development applied to a synthetic cortisone could be at least as rewarding. Workers in Sweden, according to the *Lancet*, claim already to have produced almost complete temporary relief of rheumatism effects with a synthetic drug related to one of the natural constituents of the adrenal gland, used in association with synthetic vitamin C. The complexity of the search is, however, made clear by a warning in the *British Medical Journal* that the substance used in Sweden may be double-edged. Canadian workers hold the view that it is capable of causing arthritis, as well as curing it.

Illicit Drugs

PROGRESS in the international control of narcotic drugs, from the first meeting in Shanghai in 1909 to the Paris Protocol of 1948, has been substantial, though sporadic. The problems in the relentless struggle against the abuse of such drugs—for addiction purposes—have brought into being various international organisations, now numbering eight. Enforcement of a highly complex legislation on a world basis is now the duty of UNO's Commission on Narcotic Drugs, aided by the Economic and Social Council. If evidence were required of the good work already undertaken by the new parent of this problem child, it could be found in the *Bulletin on Narcotics*, the first number of which has been published by the United Nations Secretariat, Lake Success. This 60-pp. booklet is to appear quarterly and will disseminate authoritative information on results obtained in control and on the fight against addiction and describe preparatory work to establish a single convention destined to replace the eight existing organisations. Identifying the country of origin of seized opium is necessarily one of the first requirements for prevention. Opium, the fundamental material of most of the illicit trade, fortunately lends itself to fairly accurate determination of origin by physical and chemical means. The natural product differs greatly in different parts of the world. One of the most important tasks engaging scientists' attention is to determine the origin of prepared opium (for smoking). Given sufficient information about the nature of raw opiums, this, too, is thought to be not insuperably difficult.

START OF UNDERGROUND GASIFICATION

Experiments to Begin Next Month near Chesterfield

THE first attempt to make use of British coal reserves by the underground gasification process is taking shape at Newton Spinney, an opencast coal site near Chesterfield. Drilling, in addition to the exploratory boreholes already cut, is expected to start about the middle of this month. The low-grade coal seam will be ignited and gas may be produced on an experimental scale early in 1950.

The Ministry of Fuel notification announcing this says the experiments will be on a small scale as a preliminary to full-scale work and are designed to discover how the more obvious difficulties may best be overcome. The opencast site was chosen because it provided easy access to the coal seam face. The site is almost unique in having the face of one coal seam already exposed by opencast working and likely to remain so for several months while a lower seam is being worked. This should ensure that the experiments, which will be carried out on the upper seam, will not delay the restoration of the site after the opencast work has been completed. An additional advantage is that the surface over the proposed area is scrub and not agricultural land.

Shallow Deposit

The Fox Earth seam consists of an upper leaf of good coal about 18-in. thick, under which there is dirt inter-banded with thin coal layers, the whole being quite unsatisfactory for mining by normal methods. Up to about 200 ft. in from the actual outcrop this seam (and its overburden) have been removed by opencast working to allow access to a better seam (the Sough) some 50 ft. lower

There is, therefore, now exposed the coal face of the Fox Earth beneath a maximum of some 40 ft. of overburden. A 4 in. borehole is to be drilled into this face and within the coal seam which slopes downwards. The far end of this borehole, about 250 ft. from the face, will be about 80 ft. below the surface. A vertical borehole will be drilled from the surface to connect to the end of this lateral hole and a second vertical borehole will be drilled also to connect about 50 ft. nearer the exposed face. The lateral hole will then be sealed from this point to the face, leaving a clear channel for air down one vertical, through the coal and up the other vertical.

The coal near the base of one vertical will be ignited and an air draught maintained through the system by a compressor. It is hoped by control of the rate of air flow, and possibly by using steam, to produce combustible gas and sensible heat at the off-take. The gas is likely to be of low grade producer or water gas type.

This first experiment will provide information, additional to that so far obtained from the U.S.A., Belgium and Russia, on which further experiments will be planned, introducing appropriate variants.

Possibilities

When it becomes possible, a separate series of trials will be carried out further from the exposed face to try and establish contact through the coal between two vertical boreholes by pressure without drilling any lateral channel.

The report from the Ministry says it is hoped to turn all the coal into gas, leaving no coke behind. The advent of the gas turbine with its capacity to use low calorific value fuels means that such gas will still be of economic value for the generation of power. This is not to say the experiments now about to start may not yield a high calorific value gas, but to point out that the value of the process will not necessarily be dependent upon this.

If the formidable difficulties can be overcome and means discovered to operate the process under the wide variety of conditions found underground it would become possible to use some at least of the vast masses of coal which by reason of thinness of seam, dirt, or other cause cannot be mined by normal methods. It has been estimated that there is much more coal in this category than in the reserves which can be brought to the surface.

Technologist's Views

At a conference this week, in London, with representatives of the technical Press, addressed by Mr. C. A. Masterman, chairman of the advisory panel on coal gasification, and Dr. A. F. Williams, of the chief scientist's division of the Coal Board, it was strongly emphasised that the present activities were intended to be in the nature purely of a preliminary "laboratory experiment in the open air." It was

(continued at foot of next page)

Statutory Prohibition of Smoke Emission?

The Case for Creating Smokeless Zones

SALISBURY has been chosen as the site for smoke trials to be conducted by the Ministry of Supply experimental establishment at Porton, near Salisbury, on and after December 5. Experiments will involve the liberation, in small quantities, of an innocuous smoke. to obtain data on the way in which smoke can be diffused and dissipated in built-up areas. The smoke, which is non-irritant and possesses only a slight smell, will cause no interference to ordinary activities.

In a paper on "The Need for Smoke Abatement," prepared for the Royal Institute of Public Health and Hygiene. on Wednesday this week, Sir George Elliston stressed the necessity for the wise and more efficient use of our fuel supplies. He recalled that a report recently issued by the Federal health authority in Washington on last winter's fatal smoke fog in Donora—when over 20 people died and 40 per cent of the population were made ill—showed that the chief culprit was sulphur dioxide, the corrosive constituent of our own fogs. About the same time, here in London, he said, a week of fog sent up deaths by 20 to 30 per cent over the average for the previous four weeks, while the number of deaths from bronchitis were more than doubled.

Two-and-a-half million tons of smoke in the form of unburned coal particles were poured each year into the atmosphere. The Fuel Research Station had recently shown that under the conditions of faulty combustion that gave rise to smoke there were heat losses four or five times greater than this in the form of burnable gases—actually crude coal gas—so that altogether the equivalent of 10 million tons of coal or more were wasted yearly as and with smoke. In other words, 2½ weeks' output of the mines each year went—though it did not vanish—into thin air.

The need for new legislation requiring prior approval of new fuel-burning installations, which was now standard practice in the U.S.A. and elsewhere overseas, was referred to by Sir George Elliston. He commended the abolition of smoke by stages through the setting up of expanding smokeless zones—in which the generation of any smoke would be prohibited—as being preferable to any of the more spectacular ways.

(A North-West campaign to encourage the use of smokeless fuel was launched at Liverpool on November 24).

START OF UNDERGROUND GASIFICATION

(*continued from previous page*)

no more than a beginning, to see if further development work was worth while.

It was the intention to utilise seams of poor coal which, by reason of their low grade, and perhaps inconvenient siting, would not otherwise be exploited. It was certainly not intended to displace any miners from their ordinary work on normal grade coal.

To begin with, a very poor quality gas was expected, because the first intention was to turn it into power, not to use it to feed a gas grid or as a base for chemical products.

As regards possible calorific value of the gas, those working on the scheme would be extremely pleased if by March next a gas even of 50 calorific value were obtained. The gas turbine was not regarded as the ultimate prime user of this underground gas.

The coal gasification panel would in due course make a report to the Scientific Advisory Committee, which would then report to the Minister of Fuel and Power, with whom would rest the decision whether it was worth while going on with the experiment.

While the resulting gas might be good enough for certain forms of power production, from information which had been received from Belgium and Russia on the work carried out in those countries it was not thought that the quality of the gas was likely to be high enough for "grid" purposes. By very late summer, 1950, however, it might be possible to give some more definite information on this and other technical points.

It had been estimated that by burning 40 acres of one seam, enough power would be obtained to supply Sheffield's needs for one year. It was not anticipated that there would be any interference with agriculture, except that it would be necessary to make occasional, fairly widely separated boreholes.

The scheme bristled with difficulties, but it had immense potentialities. The immediate costs of the undertaking in the next few months were likely to run to about £3000 a month.

VITAL WEST-ZONE PLANTS REPRIEVED

Large Increase of German Oil, Steel and Rubber Potential

IN a statement last week announcing the retention of a number of West German synthetic oil and rubber and steel plants which were to be dismantled. Sir Brian Robertson, chairman for the month of the High Commission, described the agreement represented by the Petersberg pact, which, he said, sought to remove causes of friction between the occupying Powers and the German people.

One of the chief of these causes had been the dismantling of industrial plants, and the Commission felt that in the agreements which members, with the approval of their Governments, had reached in the settlement they had made to Germans a generous contribution; indeed, a maximum contribution.

The ten clauses in the protocol permitting the retention of the rubber oil and steel plants provide for Western Germany's future inclusion in the Ruhr International Authority, gradual re-establishment of German consular and diplomatic services and permission to build ocean-going ships (up to 7200 tons) and certain other vessels.

The dismantling clauses will result in immediate cessation of dismantling at 11 synthetic rubber and oil factories—except for certain research equipment involving " an important security element." These include the Gelsenberg Benzin A.G.

Dismantling at eight steel plants, including the August Thyssen works with a capacity of 2 million tons annually, is also to stop. Non-essential electric furnaces will, however, continue to be removed, as will equipment for producing synthetic ammonia and methanol from the I. G. Farben plant at Ludwigshafen.

All dismantling will also cease in Berlin —including the Borsig works in the French sector—and work will start again in the factories concerned.

Equipment already removed, except in the case of Berlin, will still be used for reparations. The present restrictions and prohibitions on production will remain; dismantled works may be rebuilt only by permission of the Allied authorities and steel production will continue to be restricted to 11.1 million tons a year.

Sir Brian Robertson, explaining the exclusion of the Salzgitter steel works from the list of plants on which dismantling is to be stopped, said the two principal reasons for refusing the strong request of Dr. Adenauer were that the plant was constructed by Göring specifically to expand the steel industry for war needs and the economic argument for returning the works had not been made out.

He emphasised that it was not intended that this agreement should be regarded as a stepping stone for further demands. The Occupation Statute was due for review in the autumn of next year, and the programme now launched was to cover the period between now and then. The Federal Chancellor had given an assurance that his Government would use its influence and authority to ensure that the balance of the dismantling programme proceeded expeditiously without obstruction.

Italy Exploring New Use for Methane Gas

AN interesting experiment in the use of methane gas in the production of Portland cement has been made by the firm of Rossi, near Piacenza, Italy. This undertaking possesses one of the longest rotating kilns in the country (90 m.) which has hitherto functioned on pulverised coal.

Technicians of the company, seeking to replace coal by methane, were faced initially with the problem that methane gives a long flame instead of the short yielded by coal. There was, moreover, always the danger of methane forming a detonating mixture. A number of measuring instruments had to be devised before the gas was admitted into the kiln, at the pressure of 1½ atm.

The crushed limestone was introduced into the kiln and subjected to a temperature of 1200-1400°C. As the inclined cylinder rotated, the limestone descended gradually to the bottom, fusing to become clinker ready for milling.

A careful checking of the processing cycle has shown that from the technical point of view the idea is acceptable. It remains now to see whether the process is satisfactory from the point of view of cost. Even if the use of methane is slightly more expensive than that of coal, the process seems likely to be adopted in Italy, as the extra cost might well be compensated by technical convenience.

FLOTATION APPLIED TO CHEMICAL SEPARATION

*Potential Use of Hydrophobic Films**

FLOTATION as a means of separation and concentration of minerals has become almost traditional and most of the work so far published in technical literature covers that aspect of flotation.

The employment of flotation as a means of separation of chemical products is, however, practicable. There is indeed a wide field of application, and the process need not be confined to the mineral salts.

Essential Conditions

Practically all the inorganic and organic products, independent of their chemical composition, are flotable, providing that the following conditions are fulfilled:—

1. It is necessary that the substances being treated should be solids and, if possible, crystallised.
2. The two compounds to be separated should not be too intimately aggregated; in all cases it is necessary that they should be capable of being separated by grinding.
3. The non-floating product must have a specific gravity higher than the density of the solution.
4. The solubility of the products should not be so great as to give the pulp a viscosity which would endanger the operation.

It is useful to predict, and to calculate in advance, the flotation conditions for each product, starting with its chemical, physical and mineralogical properties. Great progress has already been realised in this direction, but there is still much to learn. The more the theory of flotation is examined, the more clear it becomes that a large number of factors intervene in the result and exert influence on the flotability and separation of the mixture.

The problem is not only to determine the factors which condition the flotability of a pure product under the influence of certain reagents, but also being able to differentiate the degree of flotability of two or several bodies constituting a mixture.

The most important factor is the aptitude of a body to be wetted, depending on the equilibrium of interfacial and superficial tensions, on the one hand, between the mineral and the water; and, on the other hand, between the mineral and air.

Although the wetting aptitude of a body may be low, it is necessary that the interfacial tension between the mineral and water should be high, and that between the mineral and air very small. In these conditions, the surface of the body becomes hydrophobic, and aerophilic.

It is not possible to measure directly the interfacial tension between the mineral and water, any more than that between the gas and the mineral; but according to Young's theory, the extent of the contact angle constitutes a measure of the wetting aptitude of a body. The greater the contact angle is, the more the body is hydrophobic.

Interfacial tensions can be influenced by the flotation reagents. These, particularly the collective reagents, are absorbed selectively by the minerals being floated. They comprise heteropolar substances. The active groups of these heteropolar molecules attach themselves to the mineral, while the inactive parts, which are most often the hydrocarbon groups, orientate themselves towards the solution and form a new hydrophobic surface.

The properties required of a reactive collector may be defined by the following characteristics:

It should be heteropolar; it is necessary for it to be absorbed selectively; and one of the groups should attach itself to the surface of the mineral and should be chemically inert as regards the liquid.

Hydrophobic Film Formation

The formation of a hydrophobic film on the mineral to be floated is the most important condition; in addition, however, it is indispensable that a foam should also be formed, which should be sufficiently stable to the surface of the liquid where it is elevated simultaneously with the floated mineral.

In differential flotation, where different minerals are being separated, with regard to their surface properties, it is sometimes necessary, in addition, to use modifying reagents. These secondary reagents form hydrophilic complexes at the surface of certain minerals and impede the flotation: they function as suppressing agents. The influence of these reagents may be permanent or temporary and can be annulled by re-activators.

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* "The Separation of Mineral and Organic Products by Flotation," by Dr. A. Guyer (*Chemie et Industrie*, Vol. 62, No. 2).

In these flotation tests, pure water, which is the traditional suspension medium in mineral flotation, was replaced by a saturated solution of salts, which take part in the flotation. Because of this, the wetting aptitude of bodies changes, and the viscosity, modified by the dissolved salts, also exerts influence on the quality of the foam produced.

In preparing the materials by grinding, it is first necessary to find the optimum fineness of the salts. If the two salts are represented by a very intimate aggregate of crystals, it is essential to grind to a high degree and the flotation has to be adapted to the fineness obtained.

In industrial chemistry it is often necessary to deal with a mixture of two pure salts. In this case, there is the possibility of adapting the grinding to the requirements of the flotation process, and it is confirmed that there exists, in each of the cases, a well defined optimum fineness.

As regards the influence of the solubility of salts on the flotation, a soluble salt exhibits a bad flotability, while flotability will be good for a slightly soluble salt. This supposition can be verified in practice; it is in this way that potassium sulphate, which is slightly soluble, floats better than potassium nitrate. There are, however, frequent exceptions to this rule: alkaline salts, for example, float better than the alkaline earth salts, which are less soluble.

The solubility of the salt has only an indirect influence; it manifests itself on the liquid by modifying the viscosity, the *p*H, the surface tension, and even the solubility of the flotation reagent. The viscosity of a solution of magnesium chloride, for instance, is thirteen times greater than that of pure water.

Care must be also taken to ensure that the salts dissolved in the pulp do not enter into intimate reaction with the flotation reagents. Barium salts and the sulphonated aliphatic alcohols are a case in point.

Working at a controlled temperature is very important, because a temperature change can exert influence on the reaction collecting reagents and the foaming agents. Generally, the operation is conducted at normal temperatures, but sometimes there is an advantage in lowering the temperature towards 0°C., provided that the liquid does not become too viscous under these conditions. When soaps are employed, it is necessary to measure them out with great exactitude.

The influence of the air introduced into the pulp by mechanical or pneumatic aeration should not be overlooked. Regarding the necessary dimensions of the gas bubbles, it has been confirmed that a diameter of about 0.5 mm. is sufficient to entrain crystals of about 0.25 mm.

Dimension of the bubbles should normally be above this minimum value, but it should also be remembered that a single bubble supports, not only one particle of salt, but several. On the other hand, it is necessary to avoid too large a bubble size, because the stability of the foam produced would not be good. The size of the bubbles is also strongly influenced by the necessary agitation of the pulp, and it is accordingly impossible to calculate in advance the aeration filler pores. In practical tests, good results have been obtained with a pore size about 0.1μ.

The tables below give some test results obtained with inorganic salts.

Separation problems of organic compounds are frequently encountered in

(continued at foot of next page)

TABLE 1. SEPARATION OF MIXTURES OF SALTS OF THE SAME CATION

Mixture 1 : 1	Reagent Sodium Oleate kg. per ton	Concentrate per cent.	Residue per cent
K_2SO_4+KCl	1.2	95.6 K_2SO_4	98.9 KCl
$K_2SO_4+KNO_3$	1.0	92.1 K_2SO_4	92.7 KNO_3
KNO_3+KCl	2.0	95.7 KNO_3	76.2 KCl
$NaNO_3+NaCl$	3.0	86.2 $NaNO_3$	81.1 NaCl
$Na_2SO_4+NaNO_3$	3.0	88.0 Na_2SO_4	58.1 $NaNO_3$

TABLE 2. SEPARATION OF MIXTURES OF ALKALINE SALTS AND ALKALINE EARTH SALTS

Mixture 1 : 1	Reagent Utinal V kg. per ton	Concentrate	
		Yield per cent	Purity per cent
$NaNO_3+Ba(NO_3)_2$	0.05	39.2 $NaNO_3$	96.9 $NaNO_3$
	0.1	74.6 $NaNO_3$	93.9 $NaNO_3$
	0.2	91.8 $NaNO_3$	91.1 $NaNO_3$
$BaCl_2 2H_2O+NaCl$	0.05	70.7 $BaCl_2 2H_2O$	93.9 $BaCl_2 2H_2O$
	0.1	80.1 $BaCl_2 2H_2O$	—
$(NH_4)_2SO_4+CaCO_3$	0.01	29.9 $(NH_4)_2SO_4$	99.7 $(NH_4)_2SO_4$
	0.03	88.5 $(NH_4)_2SO_4$	99.1 $(NH_4)_2SO_4$
$(NH_4)_2SO_4+CaSO_4$	0.015	46.9 $(NH_4)_2SO_4$	98.8 $(NH_4)_2SO_4$
	0.03	96.1 $(NH_4)_2SO_4$	96.2 $(NH_4)_2SO_4$

The Higher Diols

New Industrial Uses in a Wide Field

From A SPECIAL CORRESPONDENT

HOMOLOGUES of ethylene glycol and propylene glycol are now assuming considerable industrial importance in many different fields. The most promising of the newer diols are butanediol, pentanediol, hexanediol, methyl pentanediol, ethylhexanediol, methoxymethyl dimethyl pentanediol and ethoxymethyl dimethyl pentanediol. As a class, these are colourless, stable, hygroscopic liquids of low volatility which have excellent solvent properties for dyes, printing inks, essential oils and various gums and resins. Except for ethylhexanediol and ethoxymethyl dimethyl pentanediol, the diols are completely miscible with water and the lower alcohols.

These new compounds are of special interest for the manufacture of plasticisers, resins and emulsifying agents; the higher diols readily form diesters possessing valuable plasticising properties. When used in concentration between 15 and 25 per cent by weight, methoxymethyl dimethyl pentanediol is of particular value as a plasticiser to improve the milling, moulding and casting characteristics of nylon plastics.

Butanediol-1,3 (butylene glycol) is less volatile and more viscous than its lower homologues and is more suitable for use as a humectant, plasticiser for casein, zein, regenerated cellulose film, gelatine and cork, etc., and for special lubricating applications. Pentanediol-2,4 or amylene glycol is a definite crystalline compound melting at 45°C. and soluble in water to the extent of 87.9 per cent by weight at 20°C. This diol is useful in the manufacture of water-bound paints and for the preparation of emulsions, soluble oils, greases and wood stains.

Hexylene glycol or 2-methyl pentanediol-2,4 is used as a solvent and coupler in textile oils, paper coatings, printing and duplicating inks, leather finishing oils, and dressings. The most viscous of the diols is hexanediol-2,5. This has a boiling point 69° lower than that of glycerol, but viscosity 37 centipoises higher. It can be dehydrated on heating with mineral acid to dimethyl tetrahydrofurane.

Octanediol or 2-ethylhexanediol-1,3 was the first glycol to be produced having limited water solubility It is durable and a highly effective insect repellent against mosquitoes, biting flies, gnats, chiggers and fleas. Resembling glycerol and propylene glycol in its lubricating action on the skin, this diol is a useful additive for cosmetic creams. The substituted 1,5-pentanediols combine the chemical characteristics of glycols with glycolesters. The ether linkage confers unique solubility characteristics which suggest their use as coupling agents and as solvents for brake fluids, duplicating fluids, cleaning compounds, adhesives and dyes.

It needs to be borne in mind, however, that, as a family, the new diols are intended primarily for industrial applications and should not be used in products intended for external or internal use, either alone or in combination with other materials, until it has been clearly established that the final product is safe for the purpose intended.

FLOTATION APPLIED TO CHEMICAL SEPARATION

(*continued from previous page*)

industrial chemistry. The problem of flotation separation applied to organic compounds is obviously different from that for mineral products. Nearly all solid organic products are more or less hydrophobic.

Good results are obtained by seeking to render the body more hydrophilic in a specific and differential manner. The flotability of organic compounds was found to be fairly different and could be considerably modified, not only by the choice of reagent, but also by the amount used. Table 3 gives some test results obtained.

TABLE 3. SEPARATION OF MIXTURES OF VARIOUS ORGANIC COMPOUNDS

Mixture		Concentrate	
Floating	Remaining	Yield per cent	Purity per cent
Naphthalene	Phthalic acid	94	94
Phenanthrene	Phthalic acid	65	98
Anthracene	Phthalic acid	25	96
Acenaphthene	Phthalic acid	49	85
Salicylic acid	Phthalic acid	88	65
Salicylic acid	Anthraquinone	70	70
Benzoin	Anthraquinone	70	84
Salicylic acid	Oxalic acid	89	93
Succinic acid	Oxalic acid	67	95
Phenanthrene	Succinic aci	39	88
Acetanilide	Pentaerythrite	88	97

FLUORESCENT MATERIALS FOR TEXTILES

The Wave Mechanics of Light Absorption

by R. W. MONCRIEFF

THE application of fluorescent materials to textiles has opened up new possibilities in respect of degree of brightness and purity of shade in which yarns and fabrics can be produced. It is true that a few fluorescent dyestuffs have long been used because of the brilliance of shade that they would give; for example, Rhodamine B has been without a peer for the purity and brightness of the pink shades that it would give on wool, but the deliberate application of fluorescent materials simply because they are fluorescent and the application of colourless fluorescent materials to textiles, are comparatively new developments.

Bowen[1] has discussed the subject of fluorescent materials according to the ideas of wave mechanics. The absorption of light by a molecule is represented as the passage of an electron from one orbital to another of higher energy, *i.e.*, when the molecule absorbs the light its potential energy is increased. The transition to the higher state of energy takes place very rapidly, in about 10^{-15} sec., and in its higher energy state both the vibrational and the electronic energy of the molecule are increased.

Chemical Change

Then the molecule collides with other molecules, *e.g.*, of water if it is in solution, and in most cases (non-fluorescent substances) is robbed in a period of less than 10^{-8} sec. of its extra vibrational and electronic energy by collisional effects and internal deactivation or by chemical change. The excited molecule (excited because it has absorbed light) is unstable and its extra energy is lost for the reasons just given, *i.e.*, it is dissipated as heat.

But some substances have a peculiarly resistant, stable, upper electronic level, and these (fluorescent) substances after their transition to a higher energy level, although they soon (10^{-12} sec.) collide with water molecules and lose their extra vibrational energy to them because their vibrations slow down due to repeated collisions, do, however, retain their extra electronic energy, of which the water molecules are unable to rob them.

The excited molecules tend to return to their original potential energy in an average time of about 10^{-8} sec. They can do this only by losing energy in some way, and as the water molecules cannot relieve them of this energy they re-radiate it as light of lower frequency than that which they absorbed. Only molecules which have a peculiarly resistant, stable, upper electronic level are, in fact, fluorescent.

In the main these substances belong to two classes. The first are substances composed of molecules containing transitional elements or rare earths, or inorganic complexes such as uranyl UO_2^{++} and platinocyanide $Pt(CN)_4^{--}$ where the electron which has transferred to a higher energy orbital is deep in the atomic shell and is not a valency electron; it is accordingly protected by its outer electrons from the consequences of the collisions which the molecule undergoes. The second class comprises organic compounds with conjugated systems of π electrons where the excitation of a π electron to a higher level has only a small influence on the structure and stability of the molecule.

Electronic Energy

A comparatively few substances are retentive of their extra electronic energy; they do not part with it to colliding molecules, but dissipate it in vibrations as light, *i.e.*, they are fluorescent. Therefore, only those substances which are singularly retentive of a higher energy state show fluorescence. Such substances are either those containing a heavy inorganic complex in which the excited electron is deep in the shell, or else are organic compounds with a conjugated electronic structure; this last group includes some dyestuffs and the new optical bleaches.

Notable Features

Features that may be noted are: The fluorescent light is of smaller frequency (longer wave-length) than the absorbed light, for the reason that some of the absorbed energy has been transformed to increased vibrational energy which has been lost in collisions. Fluorescent materials when they are exposed to ultra-violet (high frequency short-wave length) light fluoresce with light in the visible spectrum, *i.e.*, light of lower frequency and longer wavelength.

Fluorescence is exhibited only by molecules whose electronically excited state is very resistant to collisions. The fluorescence spectrum is largely independent of the absorbed light, for if the absorbed light has a higher frequency more energy as vibrational energy will be lost by collisions.

The increase in the electronic energy due to the transition of an electron to an orbital of higher energy will be the same, irrespective of the frequency of the absorbed light. Therefore the energy that has to be dissipated as re-emitted light (fluorescence) will be largely independent of the frequency of the light absorbed.

Wide Range of Uses

Fluorescent materials are fairly widely used, apart from their recent application to textiles. Those incorporating heavy metals, *e.g.*, tungstates, are used as X-ray viewing screens. Similarly, the viewing screen of television sets is illuminated by fluorescent materials; the viewing screen is a cathode-ray tube painted with a fluorescent compound.

Those organic fluorescent agents, which are colourless, can be used not only as optical bleaches but also as invisible ink, which becomes visible when it fluoresces on exposure to ultra-violet light.

Although daylight is rich in ultra-violet light, it is convenient to have in a laboratory engaged on work on fluorescent compounds a source of ultra-violet light substantially free from visible light. The G.E.C. " Osira " lamp which, with auxiliary apparatus including a choke, can be run off an electric light socket, is convenient for this purpose. The bulb is dark in colour and takes a minute or so after being switched on to warm up, but when it has warmed up its " light " causes fluorescent materials to glow brightly and enables rapid appraisal of fluorescent properties to be made.

Rhodamine B

Yarn that has been dyed with Rhodamine B glows brilliantly under such a light. The light is useful, too, for differentiating between mineral and vegetable oils; the former usually glow brilliantly, the latter not at all, or only weakly. Probably this behaviour is due to the greater unsaturated content of the mineral oils.

Some curious personal effects can be noted under the radiation from such a lamp. A grease spot on the clothes will often glow; hair to which an oil dressing has been applied may shine vividly in the darkness; lipstick containing rosin or some such fluorescent colouring matter will be particularly vivid, and so will finger nail varnish; false teeth, too, are readily distinguished from natural.

Fluorescence depends on the retention by the molecule of the increased electronic energy, despite frequent collisions with other molecules. Molecules of some substances are more greedy for this extra energy than others. Because water molecules are unable to rob the molecules of a fluorescent material of its extra electronic energy, it does not follow that molecules of other substances share this inability. In fact, other kinds of molecules will rob the excited molecules of their extra electronic energy, dissipate it as heat, or as chemical energy, and so inhibit fluorescence.

It has, too, been found that fluorescent substances will sometimes photo-catalyse or photo-sensitise a reaction, and when they do this the energy which is ordinarily lost as fluorescent light is used instead to start a chemical reaction and the fluorescence is lost.

Quinine Bisulphate

Jette, West and Müller[2] investigated the inhibiting action which some substances have on fluorescent solutions. They experimented with quinine bisulphate, with the sodium salt of fluorescein and with uranyl sulphate, all of which are fluorescent. They found that the decomposition of a solution of glucose was sensitised by the presence of light-activated uranyl sulphate, but that glucose extinguished the fluorescence of uranyl sulphate. The energy that uranyl sulphate has available for fluorescence, if used for photo-sensitising a reaction is no longer available and fluorescence is extinguished.

Many salts inhibited fluorescence, and in nearly every case it was the anion that was responsible. The order of the extinguishing effect of the anions was:

$$I' > CNS' > Br' > Cl' > Ox'' > Ac' > SO_4'' > NO_3' > F'$$

Thus, iodides show the maximum extinguishing effect of fluorescent solutions, then thiocyanates, then bromides, and so on. If, therefore, a fluorescent substance is to be applied to a textile material, care must be taken that no substance which will extinguish the fluorescence is present.

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(To be continued)

Metallurgical Section

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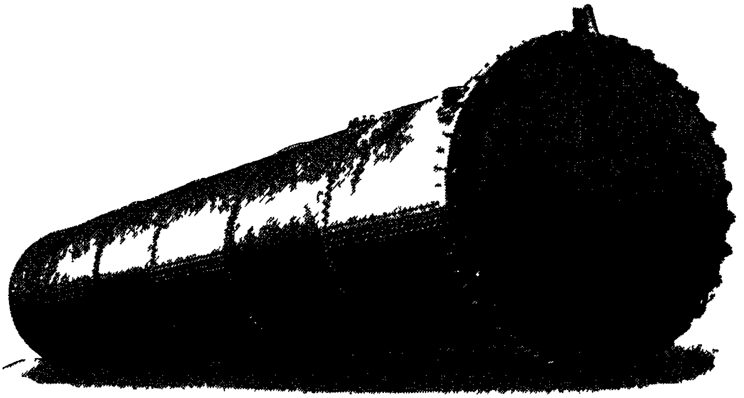

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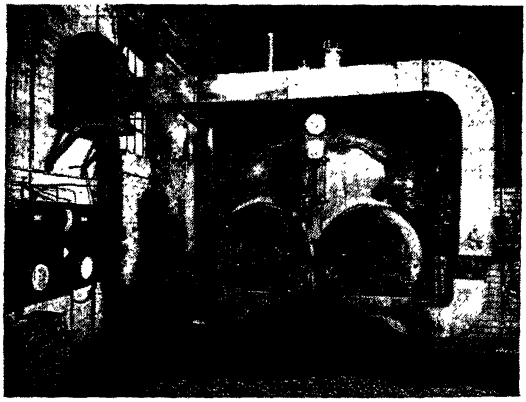

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Metallurgical Section

3 December 1949

Corrosion Resisting Steels

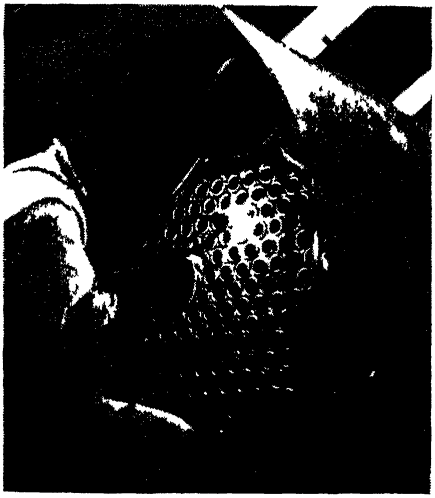
Qualitative Review of Grades for Chemical Industry

by J. A. McWilliam, T.D., M.A.

THE term "corrosion-resisting steels" is used in preference to the more common "stainless steels," because no metal can be described as stainless under all corrosive conditions.

Corrosion-resisting steels have now been in use for the manufacture of chemical plant for some 25 years, and even as far back as 1929, Hatfield[1] read a paper to the Institution of Chemical Engineers entitled "The Fabrication of Acid-Resisting Steel Plant." This dealt comprehensively with the fabrication of the 18/8 steels which were available at that time.

There are many different qualities of corrosion-resisting steels, and each has its own particular use; this is a point which should be recognised not only by designers, but also by management and foremen engaged in plant operation and maintenance. Even today the term "stainless steel" is often seen on blue-prints when the exact quality of steel should have been specified.



Argonarc welding Staybrite tubes to a header plate. Tubes and plate are both of FDP grade of non-corroding steel

Hatfield,[2] in 1942, in his lecture on acid- and heat-resisting steels, given to the Institute of Chemistry, divided the corrosion-resisting steels into three groups:

(1) Plain chromium steels (12/20 per cent chromium) with different carbon contents.

(2) High chromium, low nickel steels (16/20 per cent chromium with 2.5 per cent nickel).

(3) Austenitic chromium-nickel steels, with or without additions of special elements such as tungsten, titanium, columbium, molybdenum and copper.

Typical analyses of steels of groups 1 and 2 are shown in Table I, and those in group 3 are shown in Table II.

The FI quality is a straight chromium steel with low carbon, sometimes referred to as stainless iron. It is resistant to mild corrosive conditions and, therefore, does not find extended use in chemical plant. FCI quality has, in addition, sulphur and molybdenum contents to impart free-cutting qualities. The free-cutting straight chromium types of stainless steel are much more readily machined than the ordinary types of stainless steel, and this is a great boon, particularly in the production of parts on automatic machines.

The FI17 type is one in which the chromium has been increased to 17 per cent and the carbon retained at 0.10 per cent. The additional chromium imparts a certain increase in the resistance to corrosion, but this steel does not have as good resistance to corrosion as the austenitic steels in group 3.

The FG type has a higher carbon content than the two previous steels, and so can be hardened to give higher mechanical properties, FCS being a free-cutting variety of the FG steel.

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* Abstracted from the paper presented before the Institution of Chemical Engineers, at Birmingham, on November 26

Where a very high degree of hardness is required, the FHM quality is used, and it will be noted that this has increased carbon and chromium contents, and in order to maintain the resistance to corrosion 0.50 per cent of molybdenum is also added.

S80 steel is of particular value to the aircraft industry as it combines excellent mechanical properties and improved corrosion resistance compared with the steels in group 1. It is normally supplied with a tensile strength of 50/60 tons p.s.i.

It will be noted that the steels in group 3, as well as containing high chromium, also contain substantial quantities of nickel; the FST quality is the original 18 per cent chromium, 8 per cent nickel type of steel which is the basis of all the steels shown in Table II. This steel is known throughout the world, and is commonly referred to as "18/8" steel. While all the steels in Table II are capable of being welded, the author does not recommend the welding of FST steel except where the corrosive conditions are particularly mild, as, for example, on light gauge sheet for decorative trim. The reason for this will be explained later and, of course, FST should not be used for welded work in chemical plant.

The FDP type is one which has probably found the most extended use in chemical plant, and it will be noted that this is similar to FST, but with an addition of titanium. The EMS quality is an easy machining variation of FDP steel, in which sulphur and molybdenum have been added to impart easy machining properties. While the machining of this type cannot really be described as free-cutting, it is, however, much more readily machined than the other 18/8 steels.

In the FSL quality it will be noted that the carbon has been reduced to 0.05 per cent which, in this case, is a maximum. The content of the chromium has been raised to 19 and the nickel to 10 per cent. This steel is very suitable for the production of cold pressings, as it is less susceptible to work hardening than the other qualities shown in Table II and, therefore, it can be recommended where severe cold-forming operations have to be encountered. It is suitable for welding.

It will be noted that FCB quality is very similar to FDP, but contains columbium instead of titanium. This quality is also particularly to be recommended for welded work of all kinds. Where resistance to scaling at high temperatures is required, this steel can safely be used up to 800° C.

FML steel has a small addition of molybdenum, which increases its resistance to corrosion compared with the steels previously mentioned. It has, however, a somewhat limited application; where corrosive conditions are too severe for FDP or FCB steels, most users prefer to come to the FMB quality, which has a molybdenum content of about 2.75 per cent. This imparts an even greater resistance to corrosion, as will be shown in the corrosion tables later in this paper.

For the production of large plates for heavy chemical plant made from molybdenum-bearing 18/8 steel, the addition of titanium has been found desirable, and the FMB Ti steel contains about 2.75 per cent molybdenum, together with 0.3 per cent titanium.

The "254" quality is the most recent quality developed by the author's company (*Firth-Vickers Stainless Steels, Ltd.*) and put on a commercial basis. It will be noted that this is a low carbon steel

TABLE I

	Group 1						Group 2
	FI	FCI	FI17	FG	FCS	FHM	S80
C. %	0.10	0.12	0.10	0.25	0.18	0.80	0.16
Si. %	0.20	0.60	0.20	0.25	0.60	0.20	0.20
Mn. %	0.20	1.20	0.20	0.25	1.20	0.20	0.20
Cr. %	13.50	13.50	17.0	13.50	13.50	17.0	16.50
Ni. %	—	—	—	—	0.25(max.)	—	2.50
Mo. %	—	0.28	—	—	0.28	—	—
S. %	—	0.23	—	—	0.23	—	—

TABLE II

	Group 3								
	FST	FDP	EMS	FSL	FCB	FML	FMB	FMB Ti	254
C. % ...	0.12	0.12	0.12	0.05	0.12	0.07	0.07	0.07	0.07
Si. % ...	0.60	0.60	0.80	0.50	0.60	0.60	0.30	0.45	0.40
Mn. % ...	0.30	0.40	1.60	0.40	0.40	0.30	0.50	1.50	0.80
Cr. % ...	18.0	18.0	18.0	19.0	18.0	18.0	18.0	17.50	18.0
Ni. % ...	8.0	8.0	10.0	10.0	10.0	9.5	8.0	9.0	18.0
Ti. % ...	—	0.60	0.60	—	—	—	—	0.30	0.60
Mo. % ...	—	—	0.28	—	—	1.25	2.75	2.75	3.75
S. % ...	—	—	0.25	—	—	—	—	—	—
Cb. % ...	—	—	—	—	1.20	—	—	—	—
Cu. % ...	—	—	—	—	—	—	—	—	2.40

containing 18 per cent chromium, 18 per cent nickel, 0.6 per cent titanium, 3.75 per cent molybdenum and 2.4 per cent copper. In common with the other qualities in Table II, this steel is capable of being welded by various methods, and it can be formed in a similar manner to the FMB quality. Electrodes for the electric arc welding of "254" are now available as a standard product.

The most important feature about this steel is its excellent resistance to corrosion; it is superior to all the other qualities shown in Table II, and shows good resistance to sulphuric acid of many concentrations and temperatures.

The physical and mechanical properties of "254" steel are as follows:—

TABLE III

Physical Properties	
Specific Gravity 8.04, equivalent to	501 lbs. cu. ft.
Modulus of elasticity (softened condition)	13,000 tons/sq. in.
Specific heat	0.12 (cals./°C. gram)
Thermal conductivity at 20° C. (c.g.s. units)	0 031
Electrical resistivity at 20° C. (microhms per cm. cube)	85
Coefficient of thermal expansion, 20-100° C.	000017 per ° C.
Magnetic Properties	
Permeability in fully softened condition	1.005 to 1.03
Typical Mechanical Properties	Normal heat-treated condition
Yield point	18 tons/sq. in.
Max. stress	39 tons/sq. in.
Elongation	47 per cent.
Reduction of area	66 per cent.
Brinell hardness No.	160
Izod impact	80 ft. lb.
Fatigue limit (10,000,000 reversals of stress unbroken)	17 tons/sq. in.

As chemical plant made from corrosion-resisting steels is usually fabricated by welding, the weldability of these steels is of the greatest importance. With the original 18/8 steels it was found that if they were heated in the range of temperature from 400° to 850° C., carbide precipitation took place along the crystal boundaries. The crystal boundaries became less resistant to corrosion, and subsequent contact with corrosive media produced intercrystalline corrosion.

The consequence was that on either side of a weld there was a belt of metal liable to suffer from intercrystalline corrosion. In order to restore the welded plant it was necessary to heat-treat by cooling quickly from 1050° C. Such treatment was not feasible on bulky or complicated plant, and this disability was overcome by the development of 18/8 steels stabilised with titanium, columbium or molybdenum.

These stabilising elements prevent carbide precipitation and intercrystalline corrosion. Fig. 1 shows an electric arc weld on some equipment where the corrosive conditions required the use of the molybdenum-bearing 18/8 type of steel. Analysis showed that the sheet which resisted the severe corrosive conditions was, in fact, the molybdenum-bearing 18/8 type, but that the sheet on the other side of the weld was an unstabilised 18/8 steel. It will be noted that the latter steel has been eaten right through by intercrystalline corrosion.

In another view of the same job (Fig. 2) it will be noted that the plain 18/8 steel suffers from general attack as well as intercrystalline corrosion, the 18/8 steel containing 3 per cent molybdenum being unattacked. The weld metal of similar analysis was also unaffected.

REFERENCES

[1] W. H. Hatfield. *Trans. Inst. Chem. E.*, 1929, vol. 7.
[2] W. H. Hatfield. Inst. of Chemistry, 1942.

(To be continued)

Fig. 1

Fig. 2

THE GERMAN FERROUS METAL INDUSTRY

Development of Hard Metals and Coatings

IT is not easy to determine with any certainty in which branches of the industry the Germans have made the most valuable contributions, but among the more interesting sections of ferrous metallurgy, which have become increasingly important in recent years, are hard metals, coatings, and general research. These have close affinities for the chemist.

A brief general note on the BIOS Overall Report No. 15: "The Ferrous Metal Industry in Germany During the Period 1939-1935" has already appeared in THE CHEMICAL AGE (*61*, 297).

Hard Metals

The section on hard metals is a short summary of the very thorough BIOS final report No. 1385 (37/6). During the war, a Hartmetallzentrale, established in 1934, controlled production, largely for tips for cutting tools and for dies. The principal members were Krupp, D.E.W. (Deutsche Edelstahlwerke) and Gebr. Böhler, with allocations respectively of 45, 7, and 3 tons—presumably per month.

Cemented tungsten carbide under the Krupp trade name Widia was first marketed in 1926. Every effort was made to conserve tungsten, and hydrogen for reduction purposes, by using carbon reduced metal. The reduction method developed by Gebr. Börchers gave a relatively pure product suitable for ammunition cores but less satisfactory in grain size.

Attempts to dispense with tungsten and use carbides of other metals met with little success, except with the V.814 grade containing 45 per cent TiC, 45 per cent VC and 10 per cent Ni, the last being found superior to Co as binder in this case.

The hard metals or carbides were regarded as the most important contribution of powder metallurgy to the war effort. The BIOS report fully details methods of metal powder manufacture, sintering and other processes.

The chief chemical plants concerned with the requisite raw materials—tungstic acid, tungsten powder, ammonium *p*-tungstate, TiO_2, CoO, Ni powder and sugar carbon—were Starck (Börchers)), Wessenfeld, Dicke & Co., Merck, I.G., and Riedel & De Haen. Visits to these works did not reveal any marked advance in known methods.

The following table gives the principal constituents of the Krupp tool tips. In all, with other makes, there were 41 standard types.

Grade	Total C per cent	Free C per cent	W per cent	Co per cent	Ti per cent
S1 ..	7.57	0.21	73.33	5.48	12.76
S2 ..	7.30	0.21	73.06	7.64	11.13
S3 ..	6 17	0.16	82.55	6.63	3.77
G1 .	5.90	0 15	87.75	5.68	—
G2	5.65	0.18	83 22	10 46	—
G3	5.50	0.32	79.32	14.46	—
H1 ..	5.83	0.12	87.82	5.66	—
H2 ..	5.83	0.16	85 14	6.80	—
F1 ...	8.10	0.06	66 86	5.48	18.30
F2 ...	12.80	0.05	32.40	5.25	46 60

Fe ranged from 0.25 to 0.71; Ni from 0.09 to 0.15; N from 0.03 to 1.1. In H2 were included V 0.5, Nb 0.2, Ta 0.77. Use of alumina in ceramic tool tips was not found very successful, despite considerable research.

Processes used for production of WC, TiC and mixed hard metal powders broadly resembled those in the U.K., although in Germany, as here, each firm had variations in detail. Mention should be made of the rotating tube reduction furnace of Krupp and others. The tube of 18/8 stainless steel revolved inside the heating element, with adjustable angle of tilt which, with rotation and automatic tapping hammer, facilitated the passage of material through furnace.

The vibration ball mills also were of interest. The vibrating portion was a carrier to hold four stainless steel ball mill containers. At full speed an eccentric shaft vibrated the carrier. The machine did its work in about one-fourth the time hitherto required.

Metal Powders

The large demand for metal powders provided opportunity to acquire considerable efficiency in handling these on a large scale. Pressing, sintering and other methods are comparable with those of the U.K. For long rectanglar briquettes the die used by Metallwerke Plansee completely eliminated the risk of slip cracks or "wedges" and Krupps' use of a special die for pressing individual tips on hand presses differed from our more conventional pill press, and proved economic for short production runs.

While hot pressing was not used for tool tips, except in the case of those made without WC, it was employed largely for hard metal balls, large ring die pellets, including those of Widia Elmarid. The latter is an unsaturated WC alloy containing 5.3 per cent total C in the carbide and 3 per cent Co as binder. Even with the non-tungsten hard metal, V.814, generally made by cold pressing/double sintering, Krupps preferred hot pressing and adopted it exclusively for ammunition cores, where it was said to be cheaper than the cold method.

As these contained only a small percentage of binder (3 per cent Ni), hot pressing would be better. The cores contained up to 92.3 per cent W, with 4.4 per cent total C, 0.03 per cent Ni, 0.30 per cent Fe, with some Ta and Nb to refine the grain. The plant used for hot pressing was interesting and ingenious, but showed no major improvement upon that of the U.K.

Krupps did not care for induction brazing, and torch brazing was too slow. They usually preferred a machine like a resistance welder made by Elektro-Apparatebau, of Lippstadt. Data were obtained on cutting angles and speeds, grinding of tips, and results of turning tests for various Widia grades.

Coatings (including cladding and bonding) form the subject of Section 8, while nitriding and related methods are included at the end of Section 6 on heat treatment.

The various methods of metallic coating and cladding, which are fairly well known, are described and have been already fully dealt with in earlier reports. Special attention is given to bi-metal work. Some notes are added on non-metallic coatings—lacquering and enamelling.

Valuable Research

In the important field of phosphating, German developments before the war had been very fully described in the technical Press. It must be recognised that here, at all events, they had done a lot of valuable research, especially for the canning and similar industries, and also in connection with phosphating as a lubricant in deep drawing or cold deformation processes.

Both in the interests of rust prevention and for lubricating purposes, rapid increase in production of phosphating chemicals was made during the war. Hot phosphating still predominated, but cold-working had made rapid strides, as also had the various methods of accelerating the practice of phosphating—down to a matter of two or three seconds. Yet the unaccelerated methods were still largely used, *e.g.*, the Parker manganese method.

The usual stages in all cases are: preliminary treatment or cleaning, phosphating, after treatment (rinsing, drying, sealing). It has been common practice to use a water-oil emulsion of 10-25 per cent Shell oil No. 54 for sealing (Rhenania-Ossag, Hamburg). Metallgesellschaft A.G. (Parker and Bonder processes) was one of the largest producers of the necessary chemicals, followed by the I.G. Frankfurt-Griesheim (Atramentol processes).

The various chemicals include metal phosphates, phosphoric acid, and accelerators in the form of nitrites, nitrates and others, also those required in the preliminary cleaning, and final rinsing and sealing (generally chromic acid in some form). The I.G. Frankfurt-Griesheim accelerator was zinc chlorate. BIOS report No. 1298 gives full details of phosphating in Germany (7s.) and HEC documents provide information on Metallges. A.G. phosphating and general anti-rust processes, Nos. 3744 and 12200 and others.

Bonderising

The Volkswagen Works has installed a very elaborate plant for bonderising motor car bodies before painting, and this may be one of the largest and most modern installations in the world (BIOS Final Report 300).

Interviews with the director of the V.D.Eh. (German Iron and Steel Association) have been recorded. Here the work included ingot moulds, basic slag deoxidation of steel, use of Al and Fe-Si to economise Mn in S.M. steel, Ti as alloying element forming with sulphur a sulphide plastic at forging temperatures, steel made in electric furnaces, furnace atmospheres, and automatic multiple wire drawing machines.

At the Technische Hochschule, Aachen, including the Giesserei Institute (Foundry Institute), some interesting work comprised development of a hot blast cupola with blast preheated to 400-450° C., whereby coke charge could be reduced to 10 per cent of metal charge, yielding improved metal with reduction of S content. Rolling cast iron at 850-870° C. for use in the production of piston rings, improved mechanical properties, *e.g.*, tensile strength was raised to 60-120 kg./mm^2. In using Al in place of Cr in heat-resistant cast iron, with C not more than 2.2 per cent, optimum Al content was 8 per cent, which may be compared with some pre-war results of the BCIRA in this country. Other work—tests on high speed steels and tool steels of superfinish on surfaces—is detailed in separate reports.

A large number of reports cover experimental research at the Deutsche Edelstahlwerke, Mulheim (iron powder production) and that of the D.E.W., at Krefeld, *e.g.*, de-oxidation with Al and Mg, corrosion- and heat-resistant steels, welding alloy steels, properties at sub-normal temperatures, creep, effect of N as alloy element, etc.

High Temperature Alloys

At the Research Institute for Materials of the D.V.L., Sonthofen, important work on high temperature alloys for use in turbo superchargers and gas turbine jet units has been carried out. Any information in this difficult field is of special interest. Blading in temperatures was 620-750°, at which precipitation hardening had to be stable. Steels with Cr 11-14 and Mn 17-19, and with Cr 14-20 and Ni 9-32, did not give high enough creep strength and scale resistance. Higher alloys with only 10-40 per cent Fe were more promising. The following were chosen for the different temperature ranges:

Temp.	C	Mn	Si	Cr	Ni	Mo	W	Co
1. Up to 700° ...	0.05–0.15	0.6–1	0.5–0.8	15	35	5	5	25
2. 650–750° ...	0.1	1–1.5	0.5–0.8	13–15	30–34	5.5–6	4–4.5	25–30
3. 750–800° ...	0.1	1–1.5	0.5–0.8	15–18	10–15	7	3	30–40

No. 1 contained also 1.3 Ta.

No. 2 contained also 1-1.3 Ti

No. 3 contained also 1.8-2.5 Ti.

A list of publications dealing with the study of materials at high temperatures is given. Other documents and volumes deal with machinability and tool life, conservation of important strategic alloys and materials thereof, with the introduction of several new steels, including lead-bearing steels. It was found that lead-bearing steels gained in machinability with use, even with Pb contents as low as 0.07 per cent; but Pb, as also Sb, Zn, Sn, and Cd, had little effect on other physical properties.

The Krupp Research Institute, Essen, undertook routine tests as well as research in several groups: heat-resisting and rustless steels, welding, general metallurgy, physics, chemistry, electro-chemistry, engineering, of which a general account is given in FD 1300/47 and 1309/1947, etc. In Volume 4 of this series (Krupp Reports 1941) are 17 articles on many subjects of great interest, *e.g.*, hydrogen embrittlement, flake formation, coal carbonisation, Cr as de-oxidising agent, and electrolytic determination of iron carbide.

In this last article a method is described by which it is possible to isolate quantitatively practically unchanged carbide from all phases of carbon steel. In all heat treatments it was shown that only FeC_3 is present.

Several interesting matters were discussed with Dr. Otto Reif, chief metallurgist at the Krupp research laboratory, Wülfrath: reduction of N content in basic Bessemer blows through additions of Na_2O; optimum combinations of Al, Mn, and Si for minimum non-metallic content when used as a de-oxidising addition to steel; conservation of Mn in additions to basic Bessemer blows; equilibria studies between bath and slag in basic Bessemer blows: solubility of N in Ni, Cr, and Mn alloyed steels. Properties of Izett and Alto steels are briefly noted.

On the subject of corrosion and related matters numerous reports have been issued, dealing, among other things, with the work undertaken by the I. G. Farbenindustrie on the metallurgy of hydrogenation plant, corrosive effect of liquid sodium on various metals, and corrosion of valve steels by lead and lead oxide, *i.e.*, decomposition products of fuels containing Pb tetraethyl.

Special attention is directed to salt water corrosion in cooling Diesel engines. Here, smooth, even flow is of prime importance; where passages are constricted or eddy currents are formed, corrosion and erosion results, as would be expected. Zn protection plates, if not placed correctly, may cause erosion due to turbulence.

Low Carbon Steel

Reference is also made to the use of low carbon steel tubing with a chromium diffused surface for boiler air heater tubes and for Diesel engines. This " Inkromierung," yielding I.K.I. steel, is effected by heating at 1020°C. for 8 hrs. The composition of the layer, which is about 0.1 mm. thick, is given as Cr 22.58-22.68 per cent, S 0.07-0.16 per cent, P 0.033-0.093 per cent, and C 0.07-0.15 per cent. This protects against corrosion, in which also the Ti content of the steel seems to play a part.

The remainder of this section deals with routine testing and control work, including radiographic and supersonic methods.

The whole report, with its comprehensive index and reference lists, is an invaluable guide to the great mass of information which has been collected by British and American teams on German ferrous metallurgy.

LEAD PROSPECTS IN SOUTH AFRICA

Further Extensive Exploitation Possible

FUTURE development of lead in the Union of South Africa is likely to be materially influenced by two main factors. First, the possibility of profitably extracting lead ore, mostly secondary, which in many deposits is finely disseminated in manganiferous earth, and secondly, the necessity that all lead ore should be smelted in the country, if the mining is to be remunerative. The continuance of high world prices for lead per ton in the U.K., now £97, makes the prospect much more attractive.

These were the main conclusions of an extensive survey of the lead deposits of South Africa made during the war by a geological survey of the Department of Mines and now published in Geological Memoir No. 39, "Lead Deposits in the Union of South Africa and South-West Africa." This has been summarised in *The South African Mining and Engineering Journal* (60, part II, 273).

Occurrences of lead have formerly been exploited at Dwarsfontein and in the Marico area. Rhenosterhoek 211 is the only occurrence in this belt where mining is being carried out actively, a concentrating plant and an experimental plant having been erected.

The dumps of wad and waste taken out since the mine first started are considered to contain about 50,000 tons with a percentage of between 10 and 15 of galena and other lead minerals. The evidence suggests that this deposit may become an important future source of lead.

Plant Erection

On Leeuwbosch 958, ten miles north of Thabazimbi, both bedded deposits and vertical veins occur, galena being the chief ore mineral in all the localities. All the prospects have been exploited by opencast workings, the deepest point exposed in any of them being 40 ft. At one locality a vertical shaft 53 ft. deep has been sunk and a crushing and concentrating plant erected. During 1940-41, development was proceeding at four localities with promising indications.

An occurrence on the farm Langlaagte 1693 is worked for barite, and the erection of a plant for the recovery of the associated galena ore was stated to be under contemplation. Available evidence suggests that the occurrence is a valuable barite deposit, with lead ore as an important associate.

In the Hay district, galena is present in an old lead mine in a series of more or less parallel quartz veins in banded ironstones. Mine operations were abandoned after nearly 700 tons of galena had been removed. Despite poor showings of galena, it is considered that this mine might yet yield an appreciable quantity.

Apart from the relatively large quantities produced at Dwarsfontein, the average annual production of all the occurrences in the Union amount to only a small proportion of the country's current requirements.

Undeveloped Occurrences

The distribution of lead ore in the Marico district is irregular and sporadic, while many of the old mines have fallen in, thus adding to the difficulty of estimating ore reserves.

Few of the known occurrences have, however, been worked out. In most cases, causes other than the exhaustion of the ore bodies were responsible for the cessation of mining activities, while many occurrences have not developed beyond the prospecting stage.

In its recent report the Department of Mines considers the most promising localities to be confined mainly to three districts: Marico, Springs and Hay (Griqualand West).

Memoir No. 39 listed four areas as offering possibilities of hidden concentrations of lead ore of economic importance, namely the Marico lead belt; the dolomite country north-west of Potgietersrust and in the vicinity of Chuniespoort; the ground occupied by the huge zenolith of the Transvaal System in the Bushveld igneous complex along the Crocodile River northwest of Brits; and the area in the vicinity of the farm Dwarsfontein 21 on both sides of the boundary between the Springs and Pretoria districts.

The Union's ore reserves cannot be accurately assessed until much more development work has been undertaken, but a very rough estimate indicates that total reserves of the known deposits are in the vicinity of 50,000 tons of lead.

Numerous lead deposits are known in South-West Africa. Most important of these is the Tsumeb deposit in which a large number of minerals are present in the ores, the most abundant being galena, while the silver and cadmium contents of the ores are also commercially valuable.

RESISTANCE WELDING

Developments in the U.S.A.

A DETAILED description of the production of stainless steel railway coaches, which are welded throughout, almost entirely by the spot-welding process, was one of the prominent features of the lecture on "Resistance Welding Developments in the U.S.A." given at the recent meeting of the Birmingham branch of the Institute of Welding, by Dr. H. B. Taylor, director of research of the British Welding Research Association, and Mr. P. M. Teanby, of the association's liaison department.

The lecture cited the example of an American firm making the pipeline for conveying oil from Texas to New York. The pipeline was being made in 40-ft. lengths by flash welding, after having formed the flat plate to a circular section. The flash weld was 40 ft. long, and the area of the weld over 200 sq. in. The whole welding operation took a little longer than one minute, which was many times faster than the fastest alternative welding method.

Production Speeds

Not only was this particular use of welding of interest from the point of view of speed welding, but it was also an extremely good example where production speeds were kept exceptionally high by use of best handling and storage.

All the operations, from receiving the flat sheet to its passing out of the factory in the form of tube, were entirely automatic, and no hand operations were necessitated in welding, positioning or handling.

Another excellent example of the economic application of flash welding was given in the form of a welded air screw. Each blade of the air screw consisted of high tensile steel sheet formed to the correct shape and flash welded together. Each blade was then flash welded to the shanks. The fact that the finished propeller performed its job satisfactorily could be taken as an indication of the completely satisfactory nature of flash welding correctly applied.

The use of 3-phase welding machines was discussed, and it appeared that they were in much wider use in America than in this country. There were many advantages to be derived from the use of this type of machine, such as balanced loading on all three phases, higher power factors, and greatly increased electrode life when welding aluminium, etc. In spite of the high initial cost of such equipment, its use was often justified by those considerations.

U.S. LEAD TOTALS

Largely Increased Imports in 1948

DESPITE the high industrial demand in the U.S.A. for lead and the record market price reached by the metal in 1948, domestic mine output increased less than 2 per cent over 1947. Industrial disputes and stoppages are quoted by the U.S. Bureau of Mines as being largely responsible for the reduction of 25,000 tons in the 1948 total of available lead.

Imports of lead were 52 per cent greater in 1948 than in 1947 partly because of the desire for American dollars abroad and the suspension of lead import duties.

Primary refineries produced 411,646 short tons of refined lead during the year, a decline of 10 per cent from the 1947 output. Of the 406,690 tons of primary lead 83 per cent was produced from domestic supplies of ore and bullion. Antimonial lead from primary refineries increased by 17 per cent over the 1947 figure to 95.004 tons.

Total consumption in the U.S.A. of primary antimonial and secondary lead in 1948 was 1,115,995 tons. The physical inventory of lead stocks at primary smelters and refineries rose 113 per cent during the year and consumers' inventories increased 30 per cent. Manufacture of metal products accounted for 77 per cent of the total lead consumed and about 10 per cent was used for chemicals.

Labrador Iron Ore

PLANS for increasing the exploitation of the iron ore deposits in the Labrador area by the Labrador Mining and Exploration Company were announced last week.

Construction of a railway is to begin next autumn. Connecting with the Gulf of St. Lawrence, it will cover 360 miles.

The amount of ore mined is initially expected to be 10 million tons a year increasing to 20 million tons.

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INFLAMMABLE PLASTICS

Some Little Regarded Risks of Thermoplastics

THE danger that the fire risks associated with some plastics and base materials of plastics may be overlooked was brought prominently to light in the course of a paper presented by Mr. H. R. Fleck and subsequent questions and answers at the recent conference at Blackpool of the British Fire Services Association, of which an extended report appears in the December issue of the *Fire Protection and Accident Prevention Review.*

Mr. Fleck directed attention to the danger inherent in the circumstance that thermoplastic resin materials can undergo depolymerisation and yield an inflammable liquid when subjected to excessive heat. This could occur, in the case of some thermoplastics, as an effect of heat generated by the cutting tool when the material was being turned on a lathe.

Plastic materials were expensive and the scrap was valuable. Hazards arose in connection with the salvage. Very often smaller firms did not realise the dangers associated with thermoplastics, particularly as plastics as a whole do not show apparent hazards. Another point that had to be borne in mind when designing plastic objects was that they should not be traps for volatile solvents.

Paint and Lacquers

Dealing with the thermosetting powders. Mr. Fleck outlined the production of resins and their incorporation with such bases as wood waste. These powders had a tendency to burn if deliberately ignited before they had been thermoset.

Another hazard of plastics arose in connection with their use in paints; they were widely used as substitutes for white lead and linseed oil, and some paints were to-day made almost entirely from plastic materials.

The nitrocellulose lacquers, with their highly volatile solvents, were particularly hazardous from a fire point of view, though stringent Government regulations had partly reduced the dangers in manufacturing processes. There were hazards arising from the application of these lacquers, but they could be mitigated to some extent by the use of flame-proof equipment and so forth.

The chief dangers arose when nitrocellulose lacquers were used in the home, where it was difficult to apply legislation. It was here, suggested Mr. Fleck, that the British Fire Services Association could be of great service by bringing to the notice of the public the dangers of plastic substances, such as toys, paints, cigarette boxes.

Mr. Fleck answered a number of questions by fire officers and representatives of industry. He acknowledged that regulations did not yet exist for notifying the carrying of stocks of plastics other than nitrocellulose, but he hoped the hazards of plastics would be classified and regulations made to cover the storage of each classification. As a chemist and a member of a local authority, he explained the action being taken by that authority with regard to the siting of plastics factories.

Questioned about the relative risks of synthetic spirits and ordinary petroleum materials, Mr. Fleck said he understood regulations covering the storage of inflammable spirits applied to all types having flash points below 73°F. Storage arrangements depended upon the volume being used, but it was good practice to build underground tanks for large quantities.

High Polymer Chemistry

A COURSE of post-graduate lectures of interest to industrial chemists, research workers, technical staff, and chemists and engineers associated with the plastics industry, will be given at Acton Technical College during the Spring Term, 1950.

The series will be given on Friday evenings at 7.30 p.m., beginning on January 3.

The Fischer-Tropsch and Related Processes will be the subject of the first two lectures by C. C. Hall, principal scientific officer, Fuel Research Station, DSIR (January 13 and 20). W. Davey (senior assistant, organic chemistry, Acton Technical College), will give two talks on The Theory of High Polymer Synthesis (January 27 and February 3).

The remaining eight lectures will be by W. H. Stevens, consulting chemist. Four will be on Polymers their Scientific and Industrial Classification, Plastics, Materials, Sources, Properties, Utilisation and Modern Industrial Processes (February 10, 17, 24 and March 3). The last four will cover Modern Methods of Testing and Analysis of Plastic Materials, Factory Procedure, Special Applications of Plastic Materials, and The Plastics Industry (March 10, 17, 24 and 31).

$6.5 M. FOR GRANGEMOUTH

More British Equipment Available

THE apparent danger that the cost of equipping the Anglo-Iranian and Distillers Company petroleum chemicals plant at Grangemouth, Scotland, might represent a very heavy tax on hard currency reserves because of the need to buy some U.S. equipment at devaluation rates, is disposed of by the ECA's final approval in Washington on Monday of the advance of $6.5 million as Marshall Aid. The sum originally mentioned was $9 million, to cover American engineering fees and services and special equipment. Later, investigation showed that sufficient British equipment would be available to reduce dependence on American sources by the equivalent of $2.5 million.

The Marshall Aid funds, says a message from Washington, will be supplied to the U.K. Government to buy the American equipment, etc., and the companies sponsoring the scheme will pay the full price of the machinery in sterling.

DDT for Packaging

A NEW departure in the field of packaging materials, which employs DDT as a pest repellent, has been notified by the DSIR's Pest Infestation Laboratory. This is in the form of cellulose wadding, in layers, impregnated with DDT.

On reaching the first lamination, claims the DSIR, the insects attacking a package find a maze of folds and tunnels which they invariably follow, instead of eating their way straight through. In their passage through these labrynths the insects pick up sufficient poison to kill them.

In the many laboratory tests made not one insect has penetrated this material. Further tests are to be conducted by PATRA and use of the material on a trial commercial scale is planned in the near future.

Lactic and Rennet Casein

Lactic casein and rennet casein will revert to private trade on January 2, 1950. Imports will be regulated by individual licences, applications for which, to cover shipments during the first quarter of 1950 or for a longer period, may be submitted now to the Board of Trade R.M.4.C., I.C. House, Millbank, London, S.W.1. The Board says that import licences for lactic casein will be granted subject to purchase also of Board of Trade stocks.

MORE FATAL ACCIDENTS

Few in Chemical Plants

MORE fatal industrial accidents and deaths from industrial diseases occurred in October than in the previous month, according to figures reported in the current issue of the *Ministry of Labour Gazette.*

Deaths from accidents in the course of employment in the United Kingdom in October were 114, compared with 108 in September and 156 (revised figure) in October 1948. Only four were reported in chemicals, oils, soaps, etc.; metal conversion accounted for five and other metal trades two.

Cases reported under the Factories Act, 1937, or the Lead Paint (Protection Against Poisoning) Act, 1926, in the U.K. in October showed one death in the pitch industry due to epitheliomatus ulceration (skin cancer). Total cases reported under the two acts numbered 41, as follows: Lead poisoning, four; other poisoning, four; anthrax, one; epitheliomatus ulceration, 19 (pitch, 11; tar, six; oil, two); chrome ulceration, 13; (manufacture of bichromates, three; chromium plating, five; other industries, five).

Industrial Health

SPEAKING on " Recent Advances in Industrial Health " to the Huddersfield Management Society, Dr. Robert Murray, H.M. Medical Inspector of Factories, instanced lead poisoning of which, in 1901, there were 1058 cases and 38 deaths; in 1947 there were only 58 cases and no deaths. Progress was due to the co-operation of doctors, research workers, management and labour. Benzene poisoning was being eliminated by the use of substitutes, and mule spinners' cancer might also be eliminated.

There were four principles used in the fight against industrial diseases: Substitution of harmless materials; mechanical handling; elimination of dust; and personal protection.

Vitamins and Analgesics

A NEW series of lectures on " Recent Developments in the Chemistry of Vitamins and Analgesics," by J. Elks and B. A. Hems, will be given in the second term at the department of chemistry of the Sir John Cass Technical Institute, London. The course starts on January 13, 1950.

The Chemist's Bookshelf

AN ADVANCED TREATISE ON PHYSICAL CHEMISTRY. Volume 1. Fundamental Principles and Properties of Gases. J. R. Partington. 1949. Longmans, Green & Co., London, New York and Toronto. Pp. xlii + 943. 80s.

This is the first volume of a highly detailed treatise intended to cover the whole realm of physical chemistry. Although designed to serve the graduate and research worker, it assumes, however, that the reader may require elementary expositions of fundamentals in every subject dealt with. Thus, for example, no knowledge of elementary calculus or even of trigonometry is presumed, and the mathematical novice is led by easy stages to the manipulation of partial differential equations and the mathematics of wave mechanics and statistical thermodynamics.

The preface, which is in part the author's apologia for a work of the Teutonic type, is interesting and stimulating. The main divisions of this volume are concerned with Mathematical Introduction, Thermodynamics, Kinetic Theory of Gases, Statistical Mechanics and Quantum Theory, Wave Mechanics, Temperature, and Properties of Gases. The last comprises nearly half the text; the properties considered, *p-v-T* relations, specific heats, viscosities, etc., are entirely physical. Much space is given throughout to historical development; advanced mathematical and physical theory is closely linked with experimental technique; and numerous collections of numerical data, *e.g.*, lists of standard free and available energies (pp. 226-228), critical data (pp. 641-646), melting and boiling points of inorganic and organic compounds (pp. 434-442), appear. There are 18,145 separate references, and papers up to the end of 1948 are included.

The section on thermodynamics contains much of the author's " Chemical Thermodynamics " but omits most of the applications. Some are found later in the present volume, and others, *e.g.*, in electro-chemistry, will presumably be considered in subsequent volumes. All the sections contain much mathematical theory, but abstruse mathematics is consistently avoided. Thus, mechanics is treated exclusively by the Schrödinger method.

The experimental side is always well to the fore but is perhaps most prominent in the section on temperature. This contains an immense amount of practical information on thermo-regulators, thermometers and thermo-couples, measurement of high and low temperatures, radiant heat, optical pyrometry, and liquefaction of gases.

There is unfortunately no name index, and the nine-page subject index must be considered inadequate. Examples of omissions are: laboratory cements (many are described on p. 588), nomography (lost in the text under the heading " The General Gas Law " p. 608), and mercury (data on vapour pressure p. 590, specific heats p. 826, relation between velocity of mercury in a capillary and pressure p. 881, use of syrupy metaphosphoric acid to keep the surface clean p. 562, etc.). Many additional references could be used with advantage.

There are very few errors and those detected are not serious, *e.g.*, the rendering of Jones as " James " (p. 269), etc.

In view of the practical importance of the theory of probability and the treatment of experimental data the omission of these subjects from the mathematical introduction is surprising. It is noted, however, that the author ignores modern practice in his statement (p. 4 and also p. 9) that when there are several variables one must be varied at a time, the others being kept constant.

The printing, lay-out and general production deserve high praise. The price, which may not be excessive considering the high quality of the work, will undoubtedly put it beyond the means of many a would-be purchaser. When completed, the treatise will become the standard work on advanced physical chemistry if the remaining volumes achieve the comprehensiveness, attention both to experimental detail and theory, and clarity of the present one.

LETTER TO THE EDITOR

"Neglected Chemical Sources"

SIR,—The standard of articles in the British technical Press is usually high, and if the impression conveyed of the manufacturing resources of the British chemical industry is sometimes not very complete, this is doubtless because such information is difficult to acquire.

However, in an article on page 623 of your issue of November 5, which has only just come to my notice, Dr. J. F. Straatman is reported as making certain statements which are rather misleading and which do justice neither to our country's achievements nor to the enterprise of those whose task in industry is to keep in the forefront of technological progress and to make the fullest and most economical use of our natural resources.

Thus, Dr. Straatman would have us believe that the plastics industry has been handicapped by the reluctance of British manufacturers to produce synthetic phenol. The facts are that synthetic phenol has been produced for many years in this country in quantities which, together with natural phenol, have been sufficient to meet the demands of the plastics industry. It was only because of the boom conditions in the plastics industry and the Government constraints on the building of new plant that phenol had to be imported from America as a temporary measure a year or so ago. Additional synthetic phenol capacity was installed as rapidly as possible and ample supplies of phenol will be available when this is ready.

Dr. Straatman's remarks about the utilisation of home-grown cellulose would lead one to believe that this country had failed through mere inanition to make use of a raw material which is ready to hand, and that we preferred to import supplies from foreign sources. He completely disregards the careful assessment which must be made of both technical and economic factors before a major change from one raw material to another is effected. The results of such an assessment frequently reveal that the real merits of a superficially attractive scheme do not warrant a change to an entirely new raw material, or that the change must be brought about gradually and by introducing it in the most favourable localities first.

Again, Dr. Straatman implies that other countries have shown interest in the manufacture of sulphuric acid from anhydrite while this country lags behind in making use of this home-produced raw material.

We are aware that Germany has long made use of anhydrite for the manufacture of sulphuric acid, but we would point out—which Dr. Straatman has failed to do—that Imperial Chemical Industries, Ltd., has made sulphuric acid from anhydrite since the early 1930's. Production has been substantially increased since then and we can assure Dr. Straatman that extension of this method of manufacture is constantly in mind; when it is desirable and possible to do so, new plant will be built. Anhydrite has also been used directly in the manufacture of sulphate of ammonia to replace sulphuric acid and thus save imports of the necessary sulphur raw materials.

One of the most serious difficulties which this country has had to face as a result of its efforts in the war is the impossibility of constructing all at once the many new plants which we, as well as Dr. Straatman, would like to see, and the construction of many plants required by the chemical industry has been delayed on this account.

Finally, from the end of Dr. Straatman's talk it would be inferred that the chemical industry has given no thought to reducing its dependence on dollar imports of raw materials. Anyone with first-hand experience of the obstacles and difficulties in the way of importing dollar raw materials will know that, quite apart from price or policy considerations, manufacturers will make almost any effort to find some other source of supply.—Yours, etc.,

J. DAVIDSON PRATT,
Director.

The Association of British
Chemical Manufacturers,
166 Piccadilly, London, W.1.
November 28, 1949.

BAC Concert

The British Association of Chemists is to hold a smoking concert at 7 p.m. on Wednesday, December 14, at the Falstaff Restaurant, Eastcheap, London, E.C.3 (Monument station). Tickets are available from Mr. W. O. Petzold, programme secretary, London section, "Ilfra Tors," Selsdon Vale, Croydon, Surrey, at 10s. each, including buffet.

Ceylon's Coconut Oil

Fresh U.K. Contract in New Year

From OUR SPECIAL CORRESPONDENT

A U.K. delegation, consisting of Mr. L. G. Fisher and Mr. G. Wigglesworth, of the Oils and Fats Division of the Ministry of Food, is at present in Colombo to negotiate a fresh agreement for the supply of copra and coconut oil from Ceylon. Under the present agreement, which expires at the end of the year, Ceylon had undertaken to supply 48,000 tons in terms of oil, 8000 tons of which is for Pakistan and the rest for the U.K.

The contract price is £55 per ton of copra f.o.b. Ceylon. The price in the open market, however, has risen considerably above the price agreed to in the existing contract, on account of the general shortage of oils and fats in the sterling area. Local coconut interests have, therefore, been urging the Ceylon Government to press for at least a 5-year agreement when the contract with Britain is revised.

The recently-appointed Ceylon Coconut Commission, in its report, has urged the necessity for guaranteeing to producers a satisfactory price over a period of years. Ceylon will, therefore, insist on an increased price for copra and coconut oil. Meanwhile, fresh coconuts have gone up in price and the market recently created a record for fresh nuts of Rs.435 per thousand. This is the highest price ever reached, and trade circles believe that this figure will be exceeded before the end of the year as the demand continues to increase.

Pakistan's decision not to devalue her currency has meant a cheapening of the price of Ceylon copra in terms of that currency. This may result in Pakistan acceding to a price higher than the present contract rate.

Improved Extraction

Arrangements are being made by the Ceylon Government to establish a hydrogenated coconut oil factory in the near future. By this new method it is expected to extract up to 99 per cent of oil from the copra milled in Ceylon. Machinery now used by private millers can rarely produce more than 90 per cent of oil, while there are many concerns utilising outmoded means of milling whose average yield is about 85 per cent. A sum of Rs.1 m. has been provided for the establishment of the factory.

The Ceylon Government Tender Board will place an order for Rs.6 million worth of machinery for the plant with a British firm which supplied the lowest quotation. The Crown Agents have been asked to inquire into the capacity of the firm concerned, as two similar undertakings by the firm in India were said not to have been completed yet.

The Ministry is also making strenuous efforts to develop the scheme to manufacture oil from rubber seeds. Mr. L. H. Manderstam, chemical consultant to the Department of Industries, has said that on technical grounds there was no reason why rubber seed oil should not be made in Ceylon and even exported at a later stage.

Availability

Doubt has been expressed, however, regarding the availability of rubber seed to meet the capacity of 50 tons a day. If sufficient quantities are available it is likely that selective extraction, whereby the fraction of rubber seed oil containing high drying qualities can be extracted, will be undertaken locally.

Ceylon may enter into a separate agreement for the supply of copra and coconut oil to Pakistan next year. At present the contract with the United Kingdom covers supplies of these commodities to Pakistan too, and at last year's copra talks the United Kingdom representatives conducted negotiations on behalf of both countries.

Ceylon Proposes Caffeine Industry

CEYLON'S Department of Industries is to undertake the manufacture of caffeine out of tea. For this it is proposed to use only tea sweepings and tea refuse, which is available in large quantities in the island at present.

It is estimated that about 30,000 tons of tea are produced in Ceylon annually, of which about 1 per cent is thrown away as sweepings and refuse. About 30 million lb. of it are totally discarded.

Chemical analysis carried out by the department has shown that this tea contains about 2 per cent caffeine, at which rate it would be possible to manufacture about 60,000 lb. of caffeine a year. Caffeine is also contained in coffee beans, kola-nuts and in cocoa beans.

PERSONAL

Dr. E. Lester Smith, of Glaxo Laboratories, Ltd., who isolated crystalline vitamin B_{12} simultaneously with American workers in Merck Laboratories, left London Airport on November 27 to take part in the discussion in the U.S.A. by the World Health Organisation, of standardisation and other problems resulting from the recent isolation and purification of vitamin B_{12} and its identification with the anti-pernicious anaemia factor. The discussions will take place in various American laboratories and are expected to continue for about four weeks.

Mr. George Munro Ashwell, president of the Institute of Packaging and chief packaging adviser of I.C.I., Ltd., leads the specialist team which sailed for the U.S.A. on December 2 to examine American methods of packaging and presentation. Other members of the team include: Mr. J. H. Singer, nominated by the ABCM, Mr. W. A. G. Pugh, nominated by the British Plastics Federation, Mr. R. A. Lodge, by the Toilet Preparation and Perfumery Manufacturers' Federation, and Mr. F. G. West-Oram, by the Glass Manufacturers' Federation. PATRA will be represented by its director of research, Dr. G. L. Riddell.

Dr. Ernest Marsden will deliver the fourth Rutherford Lecture of the Physical Society at the Science Museum, London, at 5 p.m. on Wednesday, December 14. The doctor, who was formerly professor of physics at Victoria University, New Zealand, and more recently secretary of the New Zealand Department of Scientific and Industrial Research, has collected much information of the early family and student life of Lord Rutherford, with whom he was associated in experiments leading to the conception of the nuclear theory of atomic constitution.

Mr. N. Howell has been appointed general manager of The Tudor Accumulator Co., Ltd., following the recent retirement of Mr. P. Cattermull. Mr. Howell's first post after qualifying as a works chemist at the Manchester College of Technology, of which he is an associate, was on the technical and laboratory staff of the associated undertaking, the Chloride Electrical Storage Company, where he gained a wide experience in the whole field of battery manufacture.

"One who moves with an ease and an equanimity in the higher atmospheres far beyond the understanding of ordinary men" was the description applied by the Public Orator to Sir Edward Appleton on whom was conferred the honorary degree of Doctor of Laws at London University on the occasion of the 113th anniversary of its foundation last week.

For their research and scholarship in several fields of study, the council of Sheffield University announces that the title of reader shall be conferred on Dr. T. S. Stevens, senior lecturer in organic chemistry, and Dr. A. S. C. Lawrence, senior lecturer in physical chemistry, shall be reader in colloid chemistry.

Prof. David Campbell, Regius Professor of Materia Medica and Therapeutics at Aberdeen University since 1930, has been elected president of the General Medical Council in place of Sir Herbert L. Eason, who died on November 2. Prof. Campbell has been chairman of the Pharmacopoeial Committee, GMC, since 1937.

Mr. D. W. Pounder, who has gone out to Malaya as assistant director of research in the Dunlop Rubber Company's rubber plantations there, was a co-patentee in one of the basic patents taken out for the Dunlopillo process, and played a leading part in its development to the commercial scale.

Evans Medical Supplies, Ltd., has appointed Mr. G. Hughes as medical representative in Tyneside, North and South Durham and North and East Yorkshire.

The appointment of Miss H. H. Edwards, Director of Nursing Services, King Edward's Hospital Fund for London, and Miss E. M. Gosling, of Unilever, Ltd., to be members of the Committee on Industrial Health Services, is announced by the Prime Minister.

Obituary

Lady Mond, whose death occurred last week at Belle-isle-en-Terre, Brittany, her birthplace, was the widow of Sir Robert Mond, eldest son of the scientist, Dr. Ludwig Mond. Lady Mond was 88.

Mr. Elias Goldberg, whose death in Tel-Aviv, on November 26, is announced, was managing director of Evans Medical Supplies (Near East), Ltd.

◆ HOME ◆

Powder Metal Works Extension

Wolstenholme Bronze Powders, Ltd., proposes the building of extensions to Springfield Works, Bolton.

Vitaminised Preparations—Purchase Tax

The Commissioners of Customs and Excise announce that in future vitamin preparations containing added drugs or medicaments, in particular preparations of vitamins combined with mineral salts, will be regarded as medicines within Group 33 of the Purchase Tax Schedule, irrespective of the amount of the additions.

Ground Sulphur Price Increases

Under Statutory Instruction 1949 No. 2195, effective on December 1, the maximum prices of ground sulphur are increased by 33s. per ton. This is due to the change in the sterling-dollar exchange rate. The previous official prices for graded sulphur ranged from £15 1s. (120 mesh, BSI) to £17 3s. 6d. (200 mesh, in small consignments).

Import Licensing Relaxations

The Board of Trade has announced that as from Nov. 22 individual licences were no longer required for the importation of glycol esters except where they are consigned from or originate in hard currency areas (as mentioned in B. of T. Press Notice, ref: 29). Individual import licences would be required for glycol ether esters.

Naphthenic Acid Prices Rise

Shell Chemicals, Ltd., states that devaluation of the pound has made it necessary to increase prices for two grades of naphthenic acid. From December 1, naphthenic acid 20 (min. 200 acid value) will cost £1 10s. per ton more and the price of naphthenic acid 9 (min. 230 acid value) will go up by £4 per ton. The price of naphthenic acid (min. 170 acid value) is unchanged.

U.S.A. Interest in Scottish Development

Eight big American organisations in the precision engineering, chemical, and electrical field are interested in creating Scottish factories, according to Sir Steven Bilsland, speaking in New York. Sir Steven is leading a Scottish Council (Development and Industry) delegation to the U.S.A. and Canada to interest specialist firms in establishing factories in the Scottish industrial estate areas. The visit is stated to have been completely successful.

Titanium Pigments

National Titanium Pigments, Ltd., is building a large new factory at Kingsway, Luton, Beds.

End of Paint Materials Directorate

The Directorate of Paint Materials will end on December 31, states the Board of Trade. Its functions, including the allocation of linseed oil, will be carried by the Raw Materials Department (RM2C) Board of Trade, Millbank, S.W.1. The director, Mr. G. Gillies Shuck, will return to private industry.

Fifty Years' Research

Congratulations from the King and from ten foreign countries were received at a reception last week marking the 50th anniversary of the Liverpool School of Tropical Medicine, one of the oldest schools of its kind, which has made many discoveries in the fight against tropical disease, particularly malaria.

Oil Refineries Machinery

Electrical machinery and switchgear for British oil refinery expansion will be subject to the requirements of the Factories Acts and of the special regulations made under those Acts, the Minister of Labour stated in the House of Commons this week. These requirements will be imposed irrespective of where the machinery comes from.

RIC Established in Dundee

The essential and far-seeing services of chemists of various branches to industry, public health and civilised amenities were called to mind in the inaugural address given last week to the newly formed Dundee and District section of the Royal Institute of Chemistry. The speaker was Dr. H. J. T. Ellingham, secretary of the institute. Mr. Andrew Dargie, city analyst of Dundee, section chairman, presided.

Coal Production

The aggregate output of deep-mined and opencast coal in Britain so far this year is 194,202,600 tons, compared with 188,692,100 tons in the same period last year. Comparative weekly production figures are:—Last week: 4,472,700 tons (deep-mined 4,275,600 tons, opencast 197,100 tons); previous week: 4,519,100 tons (deep-mined 4,289,700 tons, opencast 229,400 tons); week ending November 27, 1948: 4,267,500 tons (deep-mined 4.088,400 tons, opencast 179,100 tons).

Next Week's Events

MONDAY, DECEMBER 5

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. (With RIC). A. M. Robertson: "Fibreglass."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 6.30 p.m. N. H. E. Ahlers: "Absorption Spectrophotometry."

TUESDAY, DECEMBER 6

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 3.45 p.m. (Food Group, joint meeting with the Society of Public Analysts and other Analytical Chemists). "Properties of Pectin and its use in the Food Industry."

Chemical Engineering Group (SCI)

London: Burlington House, W.1, 5.30 p.m. Dr. W. H. J. Vernon and Dr. K. R. Butlin: "Underground Corrosion of Ferrous Metals: Causes and Prevention."

The Institute of Physics

Glasgow: University, 7 p.m. (Scottish Branch). Prof. N. F. Mott (University of Bristol): "The Physical Explanation of the Strength of Metals."

Hull Chemical and Engineering Society

Hull: S. J. Porter: "Zirconia"; P. A. Andrews: "Industrial Dust Recovery."

Institute of Metals

Swansea: University College, Singleton Park, 6.30 p.m. (South Wales Local Section). Asst. Prof. R. Higgins: "Refractories with Special Reference to Slag Corrosion."

Electrodepositors' Technical Society

Birmingham: James Watt Institute, Great Charles Street, 6.30 p.m. Dr. A. T. Steer: "Hard Chromium Deposits as a Means of Resisting Wear."

WEDNESDAY, DECEMBER 7

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7.0 p.m. C. C. Henderson: "Stud Welding."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. N. Davidson: "Design of Wire Drawing and other Cold Working Machines."

THURSDAY, DECEMBER 8

Incorporated Plant Engineers

Newcastle-on-Tyne: Turks Head Hotel, 7.15 p.m. K. Marwood: "The Use of Electronics in Industry."

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. Dr. F. P. Bowden (University of Cambridge): "Some Physical and Chemical Effects of Friction."

Institute of Metals

London: Waldorf Hotel, Aldwych, W.C.2 (with Institute of British Foundrymen). P. D. Liddiard and P. G. Forrester: "Casting Copper-Lead Bearings."

FRIDAY, DECEMBER 9

Society of Chemical Industry

London: King's College, Strand, W.C.2, 7.0 p.m. (Fire Chemicals Group). Dr. B. A. Hems (Glaxo Laboratories, Ltd.): "A Synthesis of L-Thyroxine."

Oil and Colour Chemists' Association

Manchester: Engineers' Club, Albert Square, 2.0 p.m. "Paint Laboratory Equipment."

Institute of Physics

Manchester: University, 7.0 p.m. Lecture by Prof. P. M. S. Blackett.

The Royal Institution

London: 21 Albemarle Street, W.1. Prof. M. G. Evans: "Oxidation-Reduction Reactions."

Manchester Statistical Society

Manchester: Albert Hall, Peter Street, 6.45 p.m. G. E. P. Box: "The Design and Analysis of a Chemical Experiment."

Society of Glass Technology

Manchester: E. Preston: "Mistakes in Glass Manufacture."

Association of Special Libraries and Information Bureaux

Liverpool: Hornby Library, William Brown Street, 2.30 p.m. S. C. Jennings (Dunlop Rubber Co., Ltd.). "The Organisation of Works Visits"; E. N. Simons (Edgar Allen & Co., Ltd.): "The Preparation of Technical Literature."

SATURDAY, DECEMBER 10

Institution of Chemical Engineers

Manchester: College of Technology, 3.0 p.m. (North-Western Branch). J. S. Forsyth and N. L. Franklin: "The Composition of Fractionating Column Products Under Various Reflux Conditions."

Society of Leather Trades' Chemists

Manchester: Engineers' Club, Albert Square, 2.0 p.m. G. H. W. Humphreys: "Some Sole Leather Problems"; G. Forsyth: "The Rapid Determination of Moisture in Leather."

◆ OVERSEAS ◆

U.S. Sulphur Tonnage

Production of native sulphur in the U.S. during August was 397,024 long tons. Apparent sales were calculated at 383,117 tons, and producers' stocks increased slightly to a total of 3,156,752 tons.

Uranium Ore in Utah

A uranium discovery about 220 miles south of Salt Lake City, Utah, has been described by the general manager of the Vanadium Corporation of America as being the best occurrence yet located in the U.S.A. and the only one to justify the erection of processing plant on the site.

U.S. Powder Metallurgy Exhibition

The annual U.S. metal powder exhibition, sponsored by the Metal Powder Association, will be held on April 25 and 26, 1950, at the Book-Cadillac Hotel in Detroit. It will present some of the latest products and developments in metal powders, fabrications and equipment.

Surinam's Bauxite

The production of bauxite in Surinam in 1948 was 2,120,000 long tons, 20 per cent higher than the figure for 1947. This was the first time that Surinam had produced more bauxite than neighbouring British Guiana. Exports were confined almost entirely to the U.S.A.

India's Manganese Exports

Greater exports of Indian manganese ore are likely, now that problems of transport are being overcome. This was revealed at a conference held in New Delhi last month between the chief controller of exports and representatives of both the Indian Government and mining interests. Exports from India in the first 10 months of this year reached 500,000 tons, compared with a total of 330,000 tons for last year.

Swiss Chemical Industry

The future of the country's chemical industry was discussed at a recent meeting of the Association of Chemical Industrialists held in Basle, Switzerland. Exports have been seriously affected by the widespread devaluation of currency since September, and trade with Eastern Europe has also declined. A statement issued after the meeting says that no improvement is likely in the near future, that the industry must adapt itself to changed conditions, and fears that some decrease in employment is unavoidable.

Ceylon's Fertiliser Project

The output of the fertiliser plant which it is proposed to erect in Ceylon is expected to amount to some 50,000 tons of ammonium sulphate a year. That would be sufficient to supply the whole of the island's requirements.

Metric System for India?

Adoption of the metric system of weights and measures throughout the country has been proposed by a special committee of the Indian Standards Institution. The gradual adoption, over 10-15 years, of this and of decimal currency was recommended.

Burma Government Buys Oil Shares

The Burma Government hopes to buy 33⅓ per cent of the shares of the British owned Burmah Oil Company, said Thakin Nu, Prime Minister of Burma, at a recent meeting of oilfield workers. Talk of confiscating the oilfields without compensation was " sheer nonsense."

Netherlands Coal

Dutch coal output in August was 984,000 tons, more than twice the monthly average in 1945. Production in prewar years averaged one million tons a month. Lower labour productivity and a shortage of miners have prevented that level being attained. Holland still imports about 25 per cent of her coal requirements.

CIBA Representatives Arrested

During the recent wave of arrests in Czechoslovakia, the representatives of CIBA in Prague and Brno, respectively, Messrs. Hichter and Hostynek, are reported to have been taken into custody. It is believed that the arrests were the result of the ruling of the Czechoslovak Government that foreign companies must not be represented in the country by Czechoslovak citizens.

Rubber Research

A new rubber research centre is to be opened by the Dunlop Rubber Company on their Regent estate in Negri Sembilan, Malaya, some 25 miles from Malacca. A new two-storey building contains large, air-conditioned laboratories for fundamental and development research work on rubber. The new centre has living quarters for its director, Dr. F. J. Paton, Mr. D. W. Pounder, who has been appointed assistant director, and for two other research chemists.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Receivership

PORTSLADE BY-PRODUCT CO., LTD., 20/22 West Street, Shoreham-by-Sea. (R., 3/12/49.) Mr. C. E. Wakeling, of Prestwood, Dyke Road Avenue, Brighton, was appointed receiver and manager on November 3, 1949, under powers contained in debenture dated November 29, 1948.

Company News

Wade Potteries, Ltd.

The statement of accounts of Wade Potteries, Ltd., to be presented to shareholders at Burslem on December 14, indicates there was a net trading profit of £43,295 in the year ended. A dividend of 25 per cent on the ordinary shares is recommended.

Attock Oil Company

Production in Pakistan by the Attock Oil Company was nearly 50 per cent higher in 1948 than in the preceding year, and trading profit increased from £30,900 to £132,900. For the first nine months of the current year there has been a further expansion of some 60 per cent, states Mr. T. T. McCreath, the company's chairman. It is hoped to pay a dividend next year, for the first time in five years.

Increases of Capital

The following increases in capital have been announced: CLIFFORD & NEALON, LTD., from £500 to £1500; GRANGERSOL, LTD., from £100 to £5000; SILVERWOOD CHEMICALS, LTD., from £5000 to £20,176; CIMEX, LTD., from £5000 to £20,000.

New Registrations

Liquid Coal Products, Ltd.

Private company. (475,223). Capital £100. Manufacturers of patent fuel and coke; carbonisers and distillers of coal, shale and other substances; gas motor spirit, oils, dyes, benzenes, naphtha, anthracenes, naphthalenes, etc. Sec.: J. Bravo, 71 Moorgate, E.C.2.

Petrosolvents (London), Ltd.

Private company. (475,330). Capital £100. Manufacturers, producers, refiners, distillers of soaps, candles, greases, tallows, petroleum products, etc. Subscriber: E. C. Drenon, 81 Kynance Gardens, Stanmore, Middlesex, research chemist.

ANTARCTIC WHALING

WHALING expeditions, employing 10 Norwegian factory ships, three British, two Japanese, one Dutch, one Russian and one South African, are bound for the Antarctic for the coming season. It is hoped that they will bring back some 30,000 whales.

Each factory ship is served by from 10 to 17 whale catchers, each with 12 to 17 men. Acting as auxiliaries will be 36 tanker transports and six refrigerated meat ships making, in all, a flotilla of some 300 ships, manned by 12,000 men. The vessels should remain in southern waters from December 22, 1949, until April 7, 1950, the provisional closing date for the season.

It is hoped that oil, meat and by-products from the catch will be worth at least £30 million, states Mr. S. G. Tregaskes, Assistant Commercial Secretary for Canada, in an article in *Foreign Trade* (6, 851). Each expedition aims to surpass the postwar record yield of 205,000 barrels of oil, established by the British factory ship *Southern Venturer*, in 1947. The largest yield ever was 240,000 barrels, achieved by a Norwegian factory ship in 1932.

Voluntary Limitation of Bleaching

TO reduce the surplus productive capacity of the textile bleaching industry a voluntary scheme has been adopted by the existing traders which would amount to complete rationalisation, if it is accepted by the Board of Trade. A new company, Bleaching Trade Reorganisation, Ltd., has been formed to acquire or dispose of real or personal property, and deal with it in such a way as to prevent or restrict under covenant its use in textile finishing. It is pointed out that even taking into account works still closed under the Government war-time concentration arrangements, present productive capacity still considerably exceeds the present and any probable future demand.

The Stock and Chemical Markets

STOCK markets have remained cautious and uncertain, reflecting the waiting attitude shown by investors. Little selling was in evidence but, on the other hand, buyers appear to be taking the attitude that caution is called for until the General Election has been held. The two factors dominating markets this week have been the further rally in British Funds and the £20 million loss foreshadowed for the British Transport Commission, necessitating the higher freight rates now proposed. The latter will have the effect of a general increase in production costs and will hit exporters as well as producers for the home market. Industrial shares have therefore not responded to the rally in British Funds.

Most movements in shares of chemical and kindred companies were small. Imperial Chemical eased to 42s., Monsanto Chemical kept at 50s., Fisons were 26s. 9d., Albright & Wilson 30s., and Brotherton 10s. shares 19s. 6d. Boake Roberts have changed hands around 25s. and Burt, Boulton & Haywood around 24s. 6d. Greeff Chemicals Holdings 5s. shares were marked 9s. At the placing prices of 22s. for the preference shares of Willows Francis Pharmaceutical Products the yield is 5½ per cent, while the 2s. 6d. ordinary shares at 3s. 4½d. will yield 7¼ per cent on the basis of the 12½ per cent dividend predicted if the directors' profit estimate is realised. Application has also been made for Stock Exchange dealings in the 5½ per cent £1 preference shares of Howards & Sons, the Ilford chemical manufacturers. There is no intention at present of introducing the ordinary shares of this company to the Stock Exchange, but this may be planned for the future.

Borax Consolidated remained firm at 57s. 6d., British Glues 4s. ordinary were 17s. 3d., but plastics shares fell back, British Xylonite receding to 57s., after an earlier gain, while De La Rue were down to 21s. 3d., and Kleemann 8s. 3d. Lever & Unilever, however, strengthened to 42s. United Molasses were steady at 37s. 6d. on the company's latest deal. The 4s. units of the Distillers Co. firmed up to 17s. 1½d. Glaxo Laboratories at £21¼ remained under the influence of the pending bonus.

Boots Drug have been firm at 48s. 6d., Beechams deferred 14s. and Sangers 22s. 4½d. Iron and steels lost part of recent gains, but later became firmer, Dorman Long being 31s. 3d., Colvilles 34s. 9d. and United Steel 27s. 9d. British Oxygen at 90s. 3d., British Aluminium at 41s. 6d. and General Refractories at 22s. were firm. Turner & Newall eased to 73s. 9d. and Dunlop Rubber to 60s. 6d.; Triplex Glass showed firmness at 17s. 3d. There were small irregular movements in oils.

Market Reports

ALTHOUGH the industrial chemical markets are without special feature an active trade is reported from most sections and inquiry for new business covers a fairly wide range of materials. In the soda products there is a certain amount of pressure for deliveries against contract commitments and a good demand continues for the potash chemicals. Further changes in the controlled price of pig lead have again altered red and white lead prices. The latest dry red lead basis price is £115 15s. per ton and for dry white lead £124 5s. per ton. Export trade continues to be good with little or no easing in the volume of inquiry. The coal tar products market continues to maintain a better appearance with tar acids moving well.

MANCHESTER.—Home-trade users of caustic soda and other alkali products are calling for steady deliveries and a satisfactory demand for a wide range of other heavy chemicals has been reported during the past week. The volume of new business on home-trade account seems generally to have been maintained at around the level of recent weeks. Shippers' inquiries have been fairly numerous and have covered a wide range of products for the usual outlets. Business in fertiliser materials is at the moment only moderate and no substantial improvement is looked for until after the turn of the year. A fair trade is being done in the by-products, more especially in the white spirits.

GLASGOW.—Shortage of supplies of xylol, both 2-5° and 3-5°, has become acute. The position has been gradually deteriorating for some time, with the gradual increase of demand for the material in Scotland. A shortage of sodium sulphate continues, although the position is showing signs of easing. The demand for carbon tetrachloride is steadily increasing. Trisodium phosphate has been in heavy demand and the delivery position is not too good at the moment. The export market is uneventful.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the extraction and purification of wax obtained from the flesh of sisal.—A.S.P. Chemical Co., Ltd., C. L. Walsh, B. A. Adams, and J. P. Cook. Jan. 15 1947. 630,270.

Process for the extraction and purification of wax obtained from plant leaves or flesh.—A.S.P. Chemical Co., Ltd., C. L. Walsh B. ,A. Adams, and J. P. Cook. Jan. 15 1947. 630,271.

Catalytic conversion.—Texaco Development Corporation. March 7 1946. 630,155.

Synthesis of carboxylic acids.—E. I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. Feb. 19 1947. 630,279.

Metal-phenol-nitrogen compounds.—Bakelite Corporation. Feb. 27 1946. 630,158.

Catalysts.—I.C.I., Ltd., and P. W. Reynolds. Feb. 26 1947. 630,161.

Alkali and acid resistant polyamine-modified phenol-formaldehyde resins.—Bakelite Corporation. March 18 1946. 630,162.

Synthesis of penicillin.—Merck & Co., Inc. March 23 1946. 630,284.

Gaseous fuel mixtures.—S. H. White. March 18 1947. 630,221.

Heat treatment of alloyed or unalloyed cast iron.—Mond Nickel Co., Ltd. (International Nickel Co., Inc.). March 22 1947. 630,093.

Manufacture of peroxides.—Distillers Co., Ltd., G. P. Armstrong, R. H. Hall, D. C. Quin, and K. H. W. Turck. April 1 1947. 630,236.

Process of treating barium and strontium sulphates.—G. & W. H. Corson, Inc. April 30 1946. 630,034.

Manufacture of aminoguanidine compounds.—I.C.I. Ltd., and G. R. Campbell. May 21 1947. 630,296.

Process of sulphiding solids.—N.V. Internationale Hydrogeneeringsoctrooien Maatschappij (International Hydrogenation Patents Co.). July 9 1946. 630.042.

Production of ketene.—Soc. Rhodiaceta. July 16 1946. 630,043.

Preparation of compounds of the cyclopentanodimethylpolyhydrophenanthrene series.—Merck & Co., Inc. July 14 1945. 630,103.

Gasification of solid carbonaceous materials.—K. Koller, and F. Esztergaly. Oct. 26 1942. 630,048.

Manufacture of azo dyestuffs.—J. R. Geigy A.G. Oct. 31 1946. 630,181.

Preparation of silica.—D. E. B. Greensmith, C. Shaw, and W. E. Langrish-Smith. Dec. 10 1947. 630,182.

Processes for the reduction of metallic oxides or metal oxide ores.—H. W. K. Jennings. (H. A. Brassert & Co.). Dec. 16, 1943. 630,122.

Device for mixing, kneading and feeding powders, more particularly thermoplastic and thermo-hardening powders, for the manufacture of shaped bars.—S.P.A. Lavorazione Materie Plastische. Dec. 14 1940. 630,304.

Fluid-heating.—Babcock & Wilcox Co. July 4 1944. 630,549.

Polymerisation process.—Phillips Petroleum Co. Dec. 14 1943. 630,484.

Alkylation of phenols.—I.C.I., Ltd., and J. E. Fearey. May 17 1946. 630,487.

Method and apparatus for cooling a powder formed from a molten metal.—H. R. Forton. June 25 1945. 630,560.

Setting compositions.—Dunlop Rubber Co., Ltd., and M. Goldstaub. May 30 1946. 630,488.

Stabilising sulphur-containing organic compounds against oxidation and setting compositions produced from such stabilised compounds.—Dunlop Rubber Co., Ltd., and M. Goldstaub. May 30 1946. 630,489.

Manufacture of derivatives of amides.—Ciba, Ltd. July 16 1945. 630,492.

Manufacture of intermediates in the synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14 1945. 630,430, 630,431, 630,432.

Heaters for viscous liquids.—Babcock & Wilcox, Ltd. Feb. 2, 1940. 630,434.

Manufacture of azo dyestuffs.—Soc. Anon. de Matieres Colorantes et Produits Chimiques Francolor. Aug. 24 1945. 630,564.

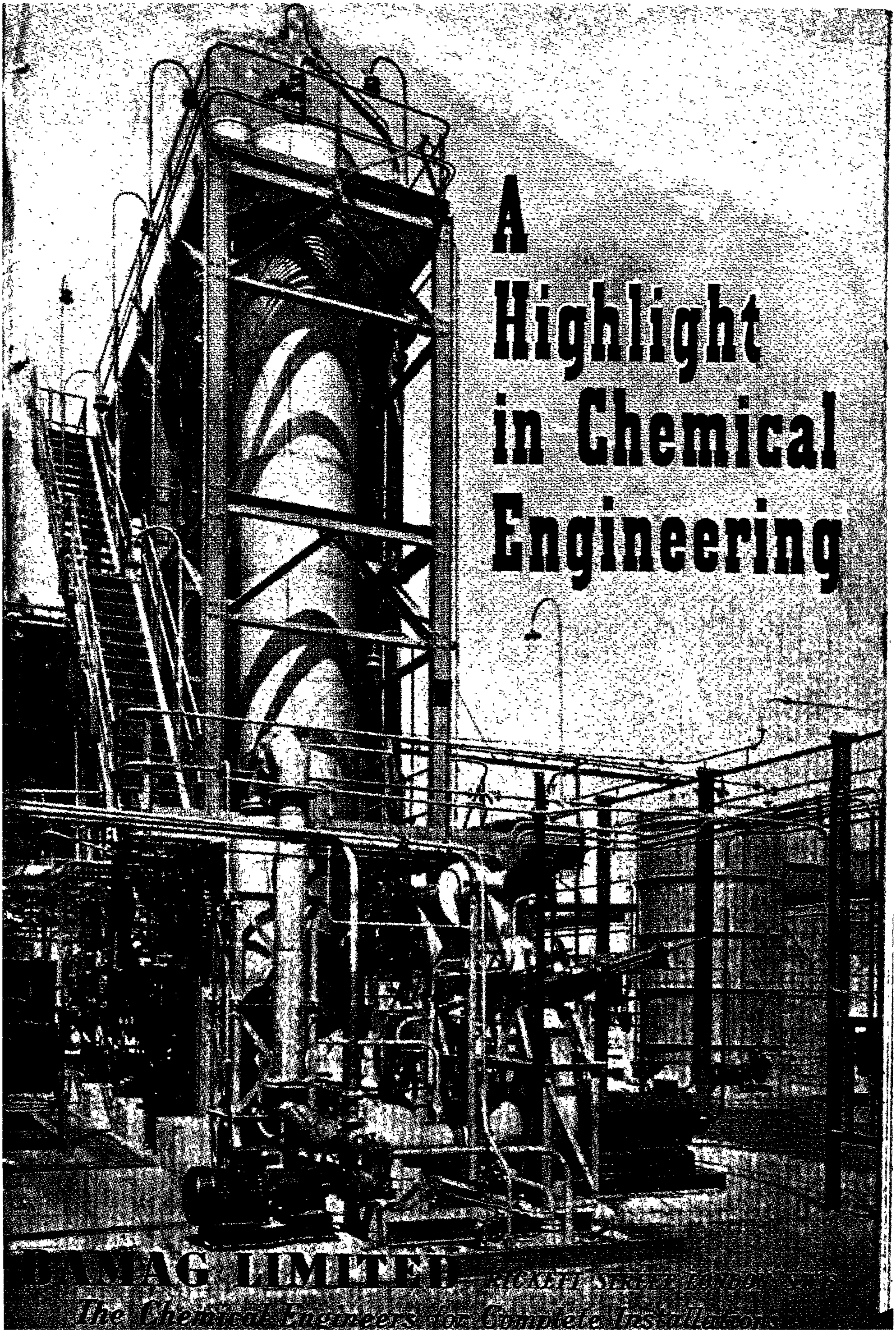
Process of producing pig iron.—C. R. Holzworth. July 25 1940. 630,566.

Flotation equipment.—A. P. Thurston. (Owens-Corning Fibreglas Corporation). Sept. 24 1946. 630,317.

Compositions containing polymeric silicones.—Westinghouse Electric International Co. Sept. 20 1944. 630,319.

Polysiloxane resins.—British Thomson-Houston Co. Nov. 21 1945. 630,445.

Glass composition.—British Thomson-Houston Co., Ltd., and J. E. Stanworth. Jan. 15 1947. 630,504.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Production of polymerisable organic materials.—I.C.I., Ltd., and R. Hammond. Dec. 30 1946. 630,370.

Apparatus for the purification of liquids. —W. Paterson. Jan. 31 1947. 630,505.

Manufacture of vat dyestuffs of the anthraquinone series.—Ciba, Ltd. Feb. 12 1946. 630,375.

Indicating instruments.—Liquidometer Corporation. June 28 1946. 630,448.

Amino acid products and method of producing same.—Sterling Drug, Inc. May 4 1946. 630,376.

Conveying machines and apparatus.—Campbell & Isherwood, Ltd., and J. Meredith. April 3 1947. 630,512.

Cutting raw or crude india-rubber.—H. R. Williams. April 3 1947. 630,451.

Manufacture of polyazo-dyestuffs.—Ciba Ltd. April 16 1946. 630,452.

Antibiotics and method for obtaining the same.—Parke, Davis & Co. May 20 1946. 630,383.

Apparatus for continuously separating liquid from solids.—C. Verdoorn, and W. M. C. Visser. May 6 1946. 630,587.

Coating compositions.—E. I. Du Pont de Nemours & Co. May 6 1946. 630,334.

Production of cellulose esters.—British Celanese. Ltd. July 2 1946. 630,388.

Pack-annealing bed.—Birdsboro Steel Foundry & Machine Co. Sept. 2 1941. 630,521.

Shale distillation process.—Standard Oil Development Co. Aug. 14 1942. 630,458.

Process for the manufacture of acid dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 5 1946. 630,525.

Process for the manufacture of dyestuffs and intermediates.—I.C.I., Ltd., and D. A. W. Fairweather. July 11 1947. 630,459.

Asphaltic bitumen compositions.—N.V. De Bataafsche Petroleum Maatschappij. July 19 1946. 630,590.

Preparation of salts of penicillin.—Glaxo Laboratories, Ltd., and W. K. Anslow. July 7 1947. 630,462.

Process for the coloration of paper.—I.C.I., Ltd., V. G. Morgan, and F. North. July 10 1947. 630,463.

Plasticised polymeric vinyl halide compositions.—B. F. Goodrich Co. March 9 1940 630,333.

Process for the manufacture of acid dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 26 1946. 630,592.

Dehydration by distillation.—Standard Oil Development Co. March 15 1947. 630,466.

Crystallisation of chemical compounds and apparatus for use therein.—Midland Tar Distillers, Ltd., R. Scott, and E. H. Joscelyne. Aug. 13 1947. 630,397.

Method of, and apparatus for, making oil gas.—Gas Machinery Co. March 20 1942. 630,398.

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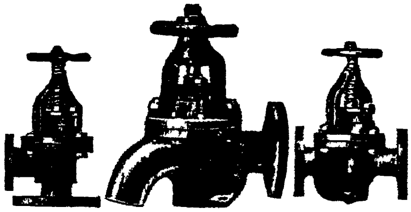
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South African Source of Uranium

INCREASING familiarity with some industrial and scientific possibilities of uranium minerals in the hands of atomic physicists, collaborating with chemists and, in particular, with chemical engineers, has imbued the subject of uranium sources with an urgency which was lacking when fissionable material seemed to belong exclusively to the sphere of abstruse research or power politics. While much of the subject matter of nuclear physics remains as remote as ever, there has lately been sufficient evidence of practical possibilities of industrial applications to lend immediate interest to the subject of source materials. The most recent illustration has been the mission by representatives of the U.S. Atomic Energy Commission and their counterparts in this country to investigate and discuss with the South African Atomic Energy Board, in Johannesburg, the possibility of recovering uranium ore as a by-product of goldmining. In the prevailing ignorance, outside some uncommunicative official circles, about the prospects of securing a supply of naturally occurring radioactive material to support the developments that have been foreshadowed the authenticated facts about the ore known to occur in vast quantities in the Rand are worthy of attention. South Africa's goldmining areas may be the world's largest single source of low-grade uranium ore.

The presence in certain Rand concentrates of a mineral known as uraninite, nearly one-half of which consists of a compound of uranium, was announced by Mr. R. A. Cooper in a paper delivered to the Chemical, Metallurgical and Mining Society of South Africa as long ago as 1923. Mr. Cooper suggested that it would be interesting to purify the uraninite by mechanical means and ascertain the true constituents of the pure mineral and its radioactive value. Until the advent of atomic power, uraninite remained a mineral of purely scientific interest. In 1945, however, the exploitation of uranium in the Union was brought under control by proclamation and subsequently a Bill providing for permanent control regulations was introduced by General Smuts himself. In the speech from the throne at the opening of Parliament, reference was made to the discovery of considerable uranium resources in the Union. The extent and richness or otherwise of the South African deposits were not revealed, but despite official reticence

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it was generally accepted that the Government was directing its attention to the possible exploitation of the radioactive materials in the Rand rock formations. Last year it was reported that uranium had been found in almost every mine on the Rand and even in the Orange Free State boreholes. Apart from the vast tonnages of uranium ore presumed to exist in the unmined ore reserves, the mine dumps or sands residues are believed to contain large quantities which might conceivably be recovered.

Secrecy is being preserved as to the percentages of uranium contained in the ores, but they certainly are not large. The extraction of minute quantities presents formidable technical problems, but very highly organised research facilities are available at the university and Government laboratories of Johannesburg and Pretoria. Once the initial problems have been overcome extraction can be undertaken by an established mining industry with the most advanced technical resources of any. Preliminary investigations are being conducted by a research committee whose chairman, Dr. B. F. Schonland, has a record of outstanding achievement in the application of engineering and scientific developments to military and mining problems.

The economic aspects of low-grade uranium ores cannot be entirely divorced from the circumstance that the Ministry of Supply's prices refer, as a rule, only to ores with a U_3O_8 content of not less than 10 per cent. For these is offered 13s. 8d. per lb. of the oxide. It seems evident, therefore, that the exploitation of extremely low-grade ores could not be an economic proposition on its own. As a by-product of goldmining, however, it is possible that the price for the product of uraninite might represent a useful addition to working profits.

A distinguished South African scientist, not long ago, expressed the opinion that it might be a hundred years before the Rand's deposits could be exploited. There is little room to doubt the accuracy of this estimate at that time. It is certain, however, that because of strategic considerations the exploitation of the Rand's enormous low-grade resources will not be governed primarily by economic considerations. The prospect is that the Rand's uranium will be recovered just as soon as technical resources permit.

Notes and Comments

West German Plant

THE uncertainty caused by the recent statement by Sir Brian Robertson that certain of the west German plants previously scheduled for dismantling had been reprieved—notably three Bergius (high pressure) and six Fischer-Tropsch plants (THE CHEMICAL AGE, *61*, 377 and 763)—has not been dissipated by a reply given in the House of Commons last week by Mr. C. P. Mayhew, Under-Secretary of State for Foreign Affairs, to a question from Mr. T. C. Skeffington-Lodge. The latter wanted to know what would be the permitted uses of the nine synthetic oil and rubber plants now excluded from the dismantling list; and whether it was intended to maintain the illegality of German manufacture of oil and rubber. Mr. Mayhew's reply (reports *Hansard*) was: "The answer to the second part of the question is, 'Yes, Sir.' The answer to the first part is that, subject to the maintenance of the prohibitions laid down in the Washington Agreement of April 1949, the future use of these plants is now a matter for German decision." Where is all this leading? The parliamentary reply apparently means that the Germans can have the reprieved plant items, but that they may not use them for the manufacture of oil and rubber. The answer to both questions may be implicit in the reported views of the German interests concerned—of which an indication is given by a special correspondent elsewhere in this issue. They, at least, plan quickly to start production in some of these plants, and seem confident that permission will not be withheld. Time will show how permanent is the ban on oil and rubber.

Contrast in Charges

COMPARISONS between State-controlled enterprises and private industries are so seldom flattering to the Government undertaking that Parliamentary spokesmen are generally careful not to invite them. Mr. Barnes must have forgotten that sensible reticence last week when, in defence of the nationalised railways' decision to raise freight rates by 16⅔ per cent to offset mountainous losses, he asked what other industry could bear a weighted average increase of 120 per cent in expenses and materials costs and raise its charges only 55 per cent. The answer to that question, assumed to be unanswerable, has quickly been supplied by Lord Selborne, in his capacity as chairman of the Cement Makers' Federation. Coal, costing 145 per cent more than it did before the war, taxes the cement industry rather more rigorously than it does the railways, says the chairman in a letter to the *Times*. It requires 8 cwt. of coal to make a ton of cement. Yet cement today costs only 53 per cent more than it did before the war and, far from losing £20 million on the year's working, the cement industry has made a profit. Were it to follow the railways' example, cement, in London, would cost another 11s. 8d. per ton. "Is that what the public may expect if cement is nationalised?" asks Lord Selborne.

Steel Facts

THE same theme—the illusory nature of the vaunted benefits of nationalisation—has received trenchant handling from the chairman of Glasgow Chamber of Commerce, calling attention, last week, to the performance by the steel industry, which tends to make the recent elaborate strategems to ensure its nationalisation more than ever irrational. Mr. Harry Yates invited attention to some of those evidences of mounting steel production which, because they recur almost month by month, are in danger of passing unnoticed. He recalled, for example, that October's steel total, at the rate of 15,959,000 tons a year, compared with a rate of 15,445,000 tons in the previous October, helped to ensure that the production target for this year would be surpassed. He stressed, too, an achievement by which the steel industry has set a goal which not many U.K. industries have yet managed to attain—by keeping steel prices below those of the U.S.A. and European countries in most markets. But for Government-planned allocations, claims Mr. Yates, there would have been larger steel exports and fewer problems in home supplies. Those who have just secured the qualified acceptance of the Iron and Steel Bill will hotly deny the truth of that, in proof of which no conclusive evidence, for or against, can be produced. Much less easily disposed of, however, is the Glasgow chairman's invitation to consider what have been the sequel to nationalisation elsewhere: scarcer, dearer and poorer coal; dearer and less efficient transport; dearer electricity.

Conservation in India

DEPLETION of metals from the accessible portions of the earth's crust is a matter of growing concern as the realisation spreads that the world is using up its non-replenishable reserves at a continually increasing pace. India is one of the countries which has recently come to recognise the alarming implications and the danger of the popular misapprehension that she possesses untold mineral wealth. The need to make the most of these reserves is being actively propagated and is reinforced by the argument that they can play an important rôle in enriching the life of the new nation. Supplies of certain metals and ores in India are quite adequate to support higher living standards, as D. N. Wadia testified at the Conservation Conference at Lake Succes. The new determination to exploit India's minerals, without delay or the waste which speculative activity can produce, is reflected by the acceptance of the Mines and Minerals (Regulation and Development) Act, 1948, by which a central authority should be able to enforce the systematic mining of ore bodies, and the strengthening of the Geological Survey of India by the recruitment of some 120 officers above the present 130. The trend of policy at the moment errs perhaps in its attempt to conserve for use within India of more minerals than the home industries may be able to use economically in their present stage of development. Instances are the export ban on beryl, monazite and other minerals associated with atomic energy projects and the stringent restriction of exports of manganese, kyanite and chromite. India's own economy may, however, be relied on to enforce more enlightened views before long.

Robert Hooke

THAT there is in fact " a destiny that shapes our ends " finds testimony in the strange career of Robert Hooke whose intellectual adventures brought into existence new schools of thought in several of the sciences. Robert Hooke, about whom Professor E. N. da C. Andrade will deliver the Wilkins lecture at the Royal Society, was a genius whose feeble constitution robbed him of the rewards which his vigorous questing intellect could have won. The exercise of the extraordinary inventiveness, which he displayed from his youth, was cheated of full development by a desultoriness which persisted all his life. Apart from his remarkable scientific insight, Hooke, who was appointed curator of the Royal Society in 1662, was also an accomplished architect. In 1667 he exhibited a model for rebuilding the City after the Great Fire which, although not adopted, procured him the post of City Surveyor. He was one of the great microscopists and also carried out noteworthy experiments on respiration and combustion. He was the first to recognise the true nature of fossils and their importance as a record of the earth's history. The nature of air, heat, and light, specific weights, laws of falling bodies, cosmology . . . nothing seemed to escape the keen eye of this consummate observer. Samuel Pepys (1666) records that he thought " his discourse, in general, fine," but his pretension to tell how many strokes a fly makes with her wings, " a little too much refined."

HARWELL'S CYCLOTRON

Good Results with Hydrogen Nuclei

THE first full trial of the recently completed frequency modulated cyclotron at Harwell, the construction and housing of which have occupied three years, was carried out successfully this week. Experience in the U.S.A. with similar very large installations supports the view that the new cyclotron will promote valuable developments in nuclear research. It enables the nuclei of most atoms to be broken up, and can also make available nuclei of new types.

The acceleration of movement of the atomic nuclei—up to 95,000 miles a second—is achieved by an accelerating voltage of a short wave radio oscillator applied in successive steps. At the moment the machine is producing a total accelerating voltage of about 160 million volts, which will finally be increased to 180 million volts or more. The atomic nuclei of hydrogen are now being used for these experiments.

Engineering Achievement

The magnet of the cyclotron, which is the largest in Europe, contains 700 tons of steel; its oil-cooled energising winding contains 80 tons of copper and consumes over 300 kW of electrical power. The oscillator can give a maximum power of 150 kW. Large vacuum pumps maintain a high vacuum in the accelerating system, which has a volume of about 500 cu. ft. The main parts of the cyclotron are cooled by circulating specially treated water.

Those operating the machine are protected by a remote control system incorporating safety circuits.

Atomic Pile Construction Stops

CONSTRUCTION of a third atomic pile at Sellafield, Cumberland, has been suspended as the result of a Ministry of Supply decision which followed the announcement in October by Mr. Attlee that Government departments were to cut their expenditure. Work on the other two piles is unaffected.

The third pile was planned to be larger than the first two, but so far only the foundations were being laid. Of the two now under construction, one has reached an advanced stage towards its completion. There is a prospect that work on it will now be accelerated. One of the principal functions of the Sellafield plant is the production of uranium and plutonium.

FIRST FRENCH PLUTONIUM

French scientists were celebrating last week a new stage in nuclear physics, represented by the production in l'Usine Atomique du Bouchet of the first 1 mg of plutonium, in the form of a pure salt. This is taken to vindicate the usefulness of the work at the first atomic pile ("Zoe") at Chatillon by M. Bertrand Goldschmidt, chemistry director (exhibiting the first plutonium) and M. Paul Berthes, director at du Bouchet (right).

Radioactive Cobalt

RADIOACTIVE cobalt (C^{60}), which has been under investigation for several years as a possible substitute for radium in the treatment of cancer, is now being used experimentally, for the treatment of selected types of the disease at the Ohio State University School of Medicine. It can be produced in nuclear reactors. Whereas radium costs between $15,000 and $20,000 per oz., radiocobalt is available to cancer researchers at a minimum charge for handling. Moreover, somewhat better results are anticipated with its use as the gamma rays from cobalt made radioactive in the pile are said to have greater activity.

Strong hopes are entertained that large-scale use may be recommended.

SCOTTISH WOOD PULPING

First Plant Operates Next Year

THE creation of a paper pulp industry in the north-east of Scotland, the first of its kind in Britain, is nearing realisation and should be accomplished early next year. The sponsors, C. Davidson & Sons, Ltd., of Mugiemoss, have had the active support of the Forestry Commission, timber merchants, landed proprietors and the Scottish Council (Development and Industry) and the latter's intervention has facilitated the importation of special plant from the U.S.A.

The company is preparing to install at Mugiemoss the special defibrators, used to pulp the small timber on which the scheme will be based. The intention is to collect waste timber from a radius of 60 miles around Aberdeen, and plans are being prepared by landowners in the area to organise regular deliveries.

It is anticipated that some 4000 tons of timber annually will be used at the start. If the scheme succeeds, this tonnage is likely to be doubled as production scope increases. The immediate objective is the manufacture of fibreboard equivalent to the best now being imported from Canada and the U.S.A.; later, production may be extended into any field where pulp can be usefully employed.

Peat Prospects

SOME new possibilities of the industrial employment of peat were reviewed at the Royal Technical College, Glasgow, on December 3, by Sir A. E. McColl, of the North of Scotland Hydro-Electrical Board. He called attention to the effect of the changing economic and technical conditions upon the economic uses of peat and to its possible application to the gas turbine. That device offered the possibility of using peat to generate power at the actual peat bogs. The Secretary of State for Scotland and the Ministry of Fuel had arranged for the erection of pilot plants in Scotland to see what could be done towards the utilisation of peat in the generation of power.

In the past owing to financial costs, peat, as a fuel, could not compete on equal terms with coal. Important changes, however, had taken place during the past 40 years or so.

In 1905 the electrical concern which he was then connected with, was buying a certain grade of coal for the steam generation of electricity at 4s. 7d. per ton at the pithead. To-day they were paying 57s. for the same type of coal, but of an inferior quality.

It had been estimated that the thermal value of peat as utilised at present in the new power stations in Eire and elsewhere was something like an 18 per cent efficiency, which with the most modern equipment could be raised to 24 per cent, very nearly that of coal. In Scotland they had some 2 million acres of peatland.

(*continued at foot of next column*)

ALCOHOL FROM PAPER PULP

By-Product Development in U.S.A.

A NEW waste-recovery by-product development, at present in its initial stages, is announced by the paper industry department of the Brown Instrument Co., New York. Half a dozen pilot plant operations are reported to have been started for the making of pulp-derived alcohol and other by-products. The types of alcohol now obtainable are stated to be suitable for rubbing preparations, and as ingredients in pharmaceuticals, perfume products, etc. While not at present produced in a sufficiently high grade suitable for human consumption, it is thought possible that, with additional refinements, grades to meet whisky requirements can be marketed.

The element in paper-making which provides the raw material from which the new alcohol is stated to be produced is the waste sulphite cooking liquor. Solids present in this contain about 20 per cent of fermentable sugars.

The highly corrosive nature of the liquor has been one of the major objections to using it as a source of alcohol. Moreover, mills lacked equipment capable of withstanding the strong acids. Now, however, new equipment capable of greater resistance is said to be obtainable at a relatively low replacement cost.

Other additional conservation measures being taken in the U.S. paper industry include what is known as the semi-chemical pulping process. This produces rougher paper products but makes it possible to use as high as 75 per cent of the original wood.

Other by-products obtainable from materials hitherto wasted in the U.S. paper industry include fusel oil, usable by the plastics and some chemical industries, saccharomyces yeast, cattle feed and chlorine and caustic soda.

STANLOW REFINERY STARTS

Initial Yield of 1M. Tons a Year

THE new Shell refinery at Stanlow, Cheshire, is now in operation, at least a month ahead of schedule. Last week the first main plant, a distillation unit and associated facilities, started up, manufacturing petrol and other petroleum products from Middle East crude oil at the estimated rate of approximately 1 million tons per annum.

After an eight-days' journey by road from Greenwich, a 115-ton, 84 ft. long oil tower reached its destination at the Shell oil refinery at Stanlow on November 29. It travelled at the rate of 30 miles a day through many large towns and cities.

Construction of the plant, achieved by a staff of some 1500, including those of the principal contractors, was commenced in 1948. The refinery is designed to refine 2.5 million tons a year of crude oil.

The Shell Petroleum Company's claim—that the principal contractors for the provision and construction of the plant are British—is indicative of the large advances which have been made in chemical and oil engineering here. Refined oil has, until now, had to be obtained from outside sources to supply the early chemical conversion processes.

The present stage of development shows substantial progress towards the final integration of refining operations, and chemicals manufacture on a single site.

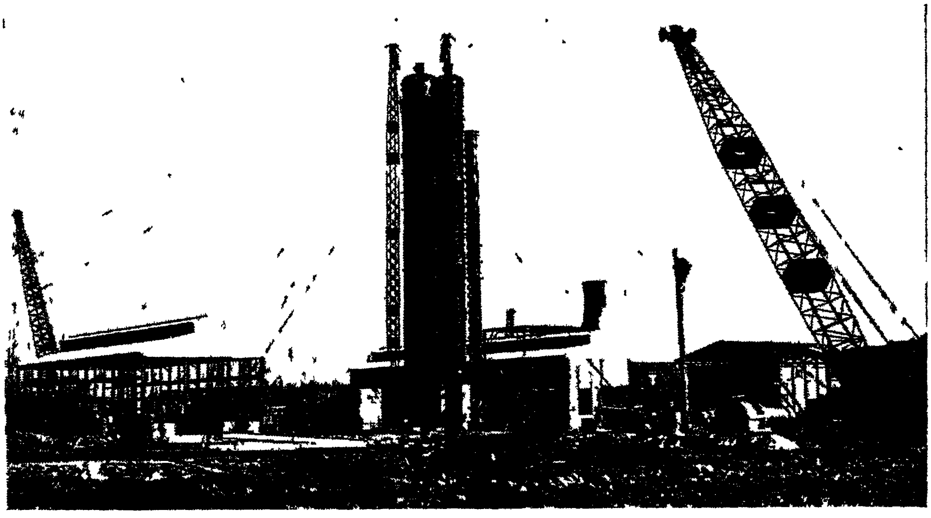
I.C.I. PROJECT OPPOSED

Fertiliser Plant near Morecambe

PROPOSALS by I.C.I., supported by the Board of Trade and Ministry of Supply, to erect a fertiliser plant and crushing mills at Middleton, near Morecambe, formed the subject of a Ministry of Health inquiry at Morecambe on November 30, when objections were heard from the Morecambe and Heysham Corporation and the directors of Middleton Towers Holiday Camp.

It was argued, for the corporation, that the plant would injure the amenities of the district, and was contrary to planning control. Witnesses for the holiday camp alleged that obnoxious smells emanated from the existing factory. The Lancashire County Council and the divisional planning authorities supported the proposal on the grounds that it was in the national interest, and recalled that in July 1948, the Ministry of Health, after a public inquiry, had decided in favour of the retention of the nearby wartime petrol refining factory. Mr. P. D. Inman, for the planning authority, said that the proposed development was the maximum to which they were prepared to agree.

The future of the fertiliser project now depends upon the Ministry ruling, which is awaited, based on the evidence at Morecambe.



The final stage in an operation which was carried through a month in advance of the programme: raising into position a fractionating column at Stanlow

Non-Ferrous Metal Stocks Reduced

October Output Slightly Lower

PRODUCTION of non-ferrous metals in October revealed a general decline compared with the previous month, and closing stocks at the end of the month also showed a small decrease on the September totals.

Details of production, consumption, and stocks (set out below) are abstracted from the summary issued by the British Bureau of Non-Ferrous Metal Statistics.

UNWROUGHT COPPER

	Long Tons Blister Copper	Refined Copper
Opening Stocks:		
Govt. and consumers	53,663	91,573
Imports	5,999	16,442
Production:		
Primary	—	9.595
Secondary	2,268*	5,547
Consumption:		
Primary	9,704	27,027
Secondary	—	14,533
Exports	2,535†	1
Closing Stocks:		
Govt. and consumers'	52,568	91,299

* Rough Copper

† Includes 780 tons rough copper dispatched to Belgium and 1,755 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,816 long tons
Alloyed copper products	23,724 ,, ,,
Copper sulphate	3,858 ,, ,,

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
Opening Stocks:		
Govt. and consumers'	32.239	73,862
Imports	10,406	4,500
Production:		
Virgin and remelted	—	4,993
Consumption:		
Virgin (incl. debased)	6,170	18,216
Remelted and scrap	—	7,629*
Exports and Re-exports	—	180
Closing Stocks:		
Govt. and consumers'	39,886	65,114

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Lead in Concentrates	Long Tons Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
Opening Stocks:				
Govt. and consumers'	—	61,491	1,903	—
Other stocks	9	—	—	—
Imports	—	12,410	—	746
Production	197	—	2,418	—
Consumption	136	13,937	2,044	12,530
Exports	—	51	—	—
Closing Stocks:				
Govt. and consumers'	—	57,348	2,277	—
Other stocks	70	—	—	—

TIN METAL

	Long Tons
Govt. and Consumers' Stocks (at end of period)	15,359
Imports	2
Production	1,971
Consumption	1,606
Exports and Re-exports	724

ANTIMONY

	Long Tons
Total Consumption of Antimony Metal and Compounds	437
Total Consumption of Antimony in Scrap	322

CADMIUM

	Long Tons
Total Consumption of Cadmium	40.55

DUCTILE CAST IRON

Advantages Claimed for New Alloy

RECENT developments in nodular cast iron in the U.S.A., which follow the important work of the British Cast Iron Research Association in producing a cast iron containing nodular graphite in the as-cast state (THE CHEMICAL AGE, *58*, 616-618, 783-784), have attracted wide interest there from foundries and users of ferrous castings.

Nodular cast iron may provide many of the advantages of malleable cast iron, or even of cast steel, in applications where the cost of these materials is too high.

The U.S. Naval Research Laboratory now claims to have developed a safe graphite nodulising alloy.* This alloy, 8 per cent magnesium in a ferro-silicon carrier, is said to have a number of important potential advantages. Its use, states a U.S. Office of Technical Services report, would lower the cost of the nodulising treatment and lessen the danger of explosive reactivity when the magnesium is added to molten iron. In contrast to nickel-magnesium and copper-magnesium alloys, it presents no problem of excessive accumulation of nickel or copper in the recirculating scrap. The separate addition of a graphitising innoculant is said to be unnecessary.

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* Report No. Pb—98919, " Recent Developments in Nodular Cast Iron," 50 cents: from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

GERMANS RESTORING PRODUCTION

Hope of Rapid Use of Reprieved Plants

NOW that a number of synthetic fuel and rubber works in western Germany have been excluded from dismantling, informed German quarters state that little harm has been done to key plant in the factories concerned by dismantling operations prior to the recent reprieve.

The synthetic fuel and rubber works removed from the dismantling list are those of Farbenfabriken Bayer, Leverkusen; Chemische Werke Huels; Gelsenberg Benzin AG, Gelsenkirchen; Hydrierwerke Scholven AG, Gelsenkirchen-Buer; Ruhroel AG, Bottrop; Ruhrchemie AG, Oberhausen-Holten; Gewerkschaft Viktor, Castrop-Rauxel; Krupp-Treibstoff-Werke, Wanne - Eickel; Steinkohlenbergwerk Rheinpreussen, Moers; Dortmunder Paraffin-Werke, Dortmund; and Chemische Werke, Essener Steinkohle, Bergkamen. Only in the case of Dortmunder Paraffin-Werke is the damage done said to amount to " millions of marks."

Efforts are now to be made to obtain permission for the restoration of the plants excluded from dismantling. The synthetic fuel plants of Gewerkschaft Viktor and Krupp - Treibstoff - Werke, which were to close down by the end of this year, are still in operation. The German interests concerned express the hope that the order to discontinue production in these works will be cancelled, and say they expect that " it is only a question of time when the synthetic and hydrogenation works rescued now will be permitted to resume production."

In the case of Farbenfabriken Bayer, an Anglo-German experts committee is to decide which parts of the central rubber laboratory are to be dismantled. Certain parts of the Huels plant have also been excluded from the dismantling stop on grounds of military security.

Chemische Werke Huels, in connection with the dismantling controversy, released certain information about " Emulsion 1073," a new product, introduced since the production of buna was stopped in 1948, which now accounts for 6½ per cent of the company's total turnover. Butadiene and styrol are the starting materials for the manufacture of the new product; up to 300 tons a month of butadiene can be used for this purpose.

While the Regional Economic Officer is of the opinion that " Emulsion 1073 " must be classified as synthetic rubber, the management at Huels has maintained that the product cannot be used for making highly elastic rubber goods, like motor tyres, and should be described as an ancillary material.

West German Industries' Rising Capacity

FACTORY extensions and new plant construction are reported by several west German firms with chemical interests. The Esso refinery in Hamburg-Harburg, which resumed operations late in 1947, has completed another stage in its reconstruction programme and has raised its processing capacity by 105,000 to 560,000 tons of crude oil a year; ultimately the refinery is to treat 700,000 tons of crude annually. Deutsche Erdoel AG is erecting a new lubricating oil plant at Hamburg-Grasbrock which is to start the production of high-class lubricating oils and specialised products early in 1950.

Kali-Chemie AG intends to reopen the potash mine of Glueckauf-Sarstedt, near Hanover, which is now being rehabilitated, and is considering a plan for the erection of a chemical works in the vicinity. Internationale Galalith-Gesellschaft AG, Hamburg-Harburg, the most important firm in its field in Germany, is now producing 75 tons of casein resin a month and intends to raise the output to 100 tons a month.

Difficulties caused by high producing costs and increased competition are reported by a number of chemical firms in western Germany. Lias-Oelschieferwerke GmbH, Frommern, near Balingen, has announced that it will close down its works because the Wuerttemberg-Baden Government no longer pays it a subsidy. The firm, having invested substantial sums in new oil processing plant since the war, requires another Dm. 1 million to complete it .

Deutsche Asphalt AG, Brunswick, has been working short time for some time because of lack of raw materials; turnover in the first half of 1949 was 600 tons a month. Marketing difficulties have forced the salt producers in the Heilbronn district to put off labour: the present turnover is between 30 and 40 per cent of the pre-war average, but repair work has made good progress of late.

Since the currency reform the west German pharmaceutical industry has not experienced any raw material difficulties, but raw material and other producing costs have risen, while selling prices in the home market have had to be left unchanged. German pharmaceutical exports at present amount to only a fraction of the pre-war volume, a fact which is due, in part at least, to the reluctance of German firms to export branded products to foreign countries in which German patent and trade mark rights are in abeyance or have been taken over by the Government. Some local subsidiaries of German pharmaceutical firms, especially in South America, have been expropriated, and the German suppliers are not willing to send pharmaceuticals and intermediates in bulk to these factories to be made up and packed on the spot.

The reconstruction of the sulphuric acid industry in eastern Germany has resulted in a substantial increase of production during 1949. In the first nine months of this year sulphuric acid production in the Soviet occupation zone is reported to have reached a monthly average 43 per cent above the level of the first half of 1948. The plant at Kanne (formerly owned by Kali-Chemie AG) has regained the output level of the pre-war years, when the capacity amounted to 17,800 tons (SO_3). The production of the former Fahlberg-List plant at Magdeburg is about 18,000 tons a year, and a new sulphuric acid factory was put in commission by Fertilia at Salzwedel in September, adding a capacity of about 10,000 tons a year. In 1950 it is proposed to raise sulphuric acid production in the Soviet zone by 90 per cent above the 1949 level, largely by reconstruction of the plant at Wolfen, which the Russians dismantled. The capacity of this plant may ultimately reach 70,000 tons (SO_3) a year, but the work is not likely to be completed before the latter part of 1951.

Soviet zone reports claim that potash production has now regained the pre-war level. In 1949 production was expected to total 1 million tons (K_2O), but in fact it will probably be several hundred thousand tons larger. Plans for 1950 provide for a further increase of 50 per cent. Production of fertilisers in general is scheduled to be increased by 110 per cent next year.

Norway Investigating Seaweed Source of Chemicals

ATTENTION is drawn to the potentialities of the Norwegian seaweed industry in a report issued by a committee of the Royal Norwegian Council for Scientific and Industrial Research, which recently founded a special research institute for the study of marine algae and the methods by which this resource can be most profitably exploited. In this they are working along lines comparable with the investigations which have been carried on in Britain in recent years (THE CHEMICAL AGE, *61*, 339 and 347).

The report states that there is probably a greater profusion of brown algae along the coast of Norway than in any other European country, and that it is primarily on this type that an expansion of the Norwegian seaweed industry would have to be based.

The new institute for seaweed research will be housed in provisional quarters in the grounds of the Oslo University at Blindern. It will be organised in a botanical and a chemical department, with three scientists in the former and one in the latter, in addition to other personnel. It will be headed by Prof. Henrik Printz, now on leave of absence from the Norwegian Agricultural College.

In a recent interview, Prof. Printz pointed out that the annual output of the Norwegian seaweed industry has to-day a value of about Kr.3 million. There are at present two Norwegian producers in the field: A/S Protan, of Drammen, which is mainly engaged in the manufacture of alginates, and Algea Produkter A/S, of Kristiansund, whose principal product is seaweed meal.

Prof. Printz maintains that, granted favourable market conditions, Norway, with her enormous seaweed resources, should be able to expand the value of her output of seaweed products to Kr.50 million per annum. Considering to what type of production such expansion of the industry should be primarily directed, the professor said that the extraction of alginic acid would, in his opinion, offer the greatest possibilities.

The Norwegian species of seaweed that, according to Prof. Printz, could be most profitably turned to account, are different species of laminaria and the very valuable ascophyllum.

ULTRA-VIOLET RADIATION TECHNIQUES

Versatility of New Industrial Equipment

THE extreme versatility of ultra-violet radiation continues to be recognised by the adoption of the principle for a growing range of industrial and laboratory techniques, especially as a ready method of identification, of sterilisation, of producing accelerated weathering and latterly as a means of bringing about chemical changes.

Wavelength Energy

Ultra-violet rays, the practical applications of which were the subject of a most comprehensive demonstration in London last week,[1] derive their potency from the energy conferred by their shorter wavelength, in relation to visible light. That energy is capable of effecting chemical changes and reactions—photo-chemical reactions, photo-physical and photo-biological changes.

In some of the numerous chemical effects ultra-violet rays are somewhat analogous to catalysts, facilitating combinations of substances, while the conversion of gases to liquids and liquids to solids by the influence of such radiation has become established practice. One familiar industrial use is the exposure of leather, treated with a suitable varnish, to produce patent leather, while more recent development has conferred important uses in several branches of the plastics industry.

The Hanovia Prospectorlite, a new battery-operated instrument to detect uranium and tungsten minerals by the strong fluorescence response

One of the more recent examples of the latter use of ultra-violet radiation is to permit the "cold welding" of Perspex acrylic sheet, which can be cemented so that the join does not interfere with the almost perfect optical properties of the material. By applying a cement to the pieces to be jointed and irradiated, the photochemical change which converts the join into solid, homogeneous Perspex is brought about. This method is used by Thermoplastics, Ltd., and the plastics division of Imperial Chemical Industries, Ltd.

Of even wider potentialities is the capacity to promote isomerisation, for which, it is recorded, Glaxo Laboratories, Ltd., is successfully employing ultra-violet radiation to convert ergosterol into calciferol (vitamin D_2).

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[1] Presented by Hanovia, Ltd

Town-Planning Intervenes

THE problem of ideal planning versus industrial development has been raised in an acute form in Edinburgh where T. & H. Smith, Ltd., manufacturing chemists, is seeking powers to erect a new boiler house across the railway line opposite its Blandfield Chemical Works. The Town Planning Officer's recommendation that this should not be permitted and that the factory should move to another location was opposed by members of the Planning Committee. Such a transfer, they pointed out, might involve a huge expenditure. No firm could be expected to provide this merely to satisfy aesthetic considerations.

The present factory had been described as "definitely a noxious industry" and too near housing. For the firm it was stressed that the product manufactured was in world-wide demand and that extension to the present factory would permit employment of a further 300 people.

The committee agreed by 5 votes to 2 not to oppose the firm's plan for a new power house.

Selective Use of Trace Metals

Important Future Factors in Biochemistry?

A NUMBER of suggestive indications of the possibility of employing the widening understanding of the rôle of trace metals in biological processes to destroy pathological organisms were mentioned by Prof. A. Albert (National University of Australia) in the course of a paper recently presented at Cambridge University. The occasion was a joint meeting of the Royal Institute of Chemistry (London and south-eastern counties section) and the Cambridge University Chemical Society, at which Dr. F. G. Mann, F.R.S., presided.

Prof. Albert, discussing chemotherapy and essential trace elements, reviewed the diversity of metals which living cells of different sorts required, such as iron, copper, cobalt, manganese, zinc, gallium, vanadium and molybdenum. All these trace metals were potentially toxic, in excess, but different species had different toxic doses and also different minimal requirements.

Metallic Ions

The question arose, what was the extent to which a special branch of chemotherapy could be consciously developed, one that would depend on increasing the concentration of a metallic ion above the tolerance limit for the parasite but below the tolerance limit for the infected tissues of the host. Or conversely, one that would depend on decreasing the concentration of an essential metallic ion below the minimum compatible with the life of the parasite but above the minimal requirements of the host.

Complexing agents, in particular those chelating agents used by analysts to segregate traces of metallic ions, provided the rough prototypes for the kind of drug envisaged. Few of these spot-test reagents, however, were able to segregate metals under physiological conditions (say 37°C. and pH 7.3) (Albert & Gledhill, 1947).

In Nature, the essential trace-metals were held by chelating agents such as the pteridines and aminoacids, so that a drug would require to compete with these for the metals. This competition would be the more successful, the higher the stability constant (K_s) of the new complex compared with the old.

$$K_s = \frac{[\text{complex}]}{[\text{complexing agent}]^{n}\,[\text{metallic ions}]}$$

where n is the valency of the metallic ion.

These constants, which could often be determined by potentiometric titration, revealed that the majority of known complexing agents combined preferentially with metals in a fixed order—the Mellor & Maley series:—

$$\mathrm{Cu} > \mathrm{Ni} > \mathrm{Co} > \mathrm{Zn} > \mathrm{Cd} > \mathrm{Fe} > \mathrm{Mn} > \mathrm{Mg}.$$

However, a few truly specific reagents are known, *e.g.*, dipyridyl and *o*-phenanthroline for ferrous iron. Other examples should now be sought.

8-Hydroxyquinoline, which has been used for 50 years, as a powerful local antibacterial agent, had recently been shown to function by disturbing the distribution of trace-metals in bacteria (Albert, Rubbo, Goldacre & Balfour, 1947).

In *Staphylococcus aureus*, a small concentration of 8-hydroxyquinoline disturbs glutamic acid metabolism, apparently by removing manganese from the cells (Gale, 1949). However, the death of these organisms, brought about by higher concentrations, is caused by the drug transporting iron (which it holds, rather loosely, in a liposoluble form) from the medium into the cell interior (Rubbo, Burvill & Albert, unpublished). In the absence of iron in the medium, this drug was not even bacteriostatic.

8-Hydroxyquinoline and its derivatives were of limited use in chemotherapy as they are inactivated by blood. Further study of fundamentals should, however, lead to the discovery of new types of drugs acting by interfering with trace-metal metabolism but having a wider range of usefulness.

Science Exchanges

EXCHANGE of scientific and technical knowledge to promote industrial efficiency has been planned by 18 Marshall Plan nations, states the council of the OEEC. The decision is based on a report by a specialist working party headed by Dr. Alexander King.

Documents on physical and biological sciences, technology and medical matters relating to industrial production are to be supplied by each member nation to all other members; national centres to receive and despatch such literature would be established. In Britain, TIDU will collate and distribute the reports.

RADIOACTIVITY AND BIOCHEMISTRY

The Royal Society Identifies Some Pioneers

SOME decisive events in the early development of radioactive isotopes and their use in biochemistry and other milestones in the growth of atomic physics were reviewed at the recent anniversary meeting in London of the Royal Society, at which the two Royal medals and the society's medals for 1949 were presented by the president, Sir Robert Robinson, O.M. (THE CHEMICAL AGE, *16*, 711).

In a series of authoritative appreciations of the work which the medals commemorated, Sir Robert Robinson made clear the pioneering character of the studies by Prof. George C. de Hevesy (Copley medallist) of the chemistry of radioactive elements and of the use of isotopes as tracers in biology.

When working under Rutherford in Manchester, the president recalled, Hevesy turned his failure to separate radium-D from lead to good advantage. He recognised that the identity in chemical properties of radium-D, and other radioactive isotopes of lead, with ordinary lead, made it possible to use these radioactive isotopes as indicators to follow the behaviour of lead in chemical processes, and in great detail, owing to the extreme sensitivity of the methods of detection of radioactivity. The first application of the idea was made with Paneth in 1913 at the Radium Institute of Vienna.

Tracer Technique

The use of radioactive isotopes as indicators or "tracers" in biological processes was initiated in 1923 by Hevesy's studies on the uptake and distribution of lead in bean plants, using radioactive lead, radium-D or thorium-B, as indicators. After placing bean plants in solutions of ordinary lead nitrate containing small amounts of radium-D nitrate, the distribution of the lead was followed by determining the radioactivity of the ash from the different parts of the plants.

This work might truly be said to have marked the opening of a new chapter in biochemistry. Furthermore, it established a pattern for the numerous subsequent researches by himself and by others which were to follow the discovery of artificial radioactive elements and the development of methods for the separation of certain stable isotopes.

Hevesy was one of the first to appreciate the potential biochemical importance of Urey's discovery of deuterium in 1932. In the following year, by experiments with fish placed in water containing added D_2O, he and Hofer showed that there is a rapid exchange between environmental water and that in the body and also that there is an exchange between the hydrogen of the environmental water and labile hydrogen atoms in the tissue constituents. In 1934 they established the very important fact that at the low concentrations of D_2O present in ordinary water the human body does not discriminate between D_2O and H_2O.

Phosphorus Investigation

In 1937 Hevesy and his co-workers again broke fresh ground by their use of the radioactive isotope of phosphorus, P^{32}, as a tracer in studies of the metabolism of phosphorus compounds. It was found that the average time during which a phosphorus atom remains in the body is 30 days.

Having established by *in vitro* experiments that there is no direct exchange between organic ester phosphate and inorganic phosphate, Hevesy and his co-workers were able to determine the "turnover" rates for certain organic phosphorus compounds in the body by isolating these compounds at intervals after the administration of labelled phosphate and estimating their content of radioactive P^{32}.

Hevesy and his collaborators obtained P^{32} labelled-adenosine triphosphate enzymatically from labelled inorganic phosphate, and clarified the rôle of this compound as a phosphate donor in carbohydrate metabolism. Further, their studies on the phosphatides in the liver and blood plasma supported the view that the plasma phosphatides are synthesised in the liver.

The president also gave appreciative summaries of the prime achievements of the other medallists: Professor Sir George Thomson (atomic physics and the wave properties of the electron); Professor R. Peters (biochemistry and vitamin B_1 in tissue metabolism); Professor A. R. Todd (organic chemistry and biochemistry, especially in relation to vitamins and nucleosides); Professor L. J. Mordell (researches in pure mathematics); Professor C. F. Powell (experimental physics and discovery and study of mesons).

Problems of Variable Composition

French Views of Non-Stoichiometric Materials

From A SPECIAL CORRESPONDENT

UNCONVENTIONAL views on the behaviour of non-stoichiometric compounds, silicates, alloys, etc., which do not obey the Dalton theory have been presented in Paris by Prof. Jacques Bénard, who has suggested the prospect of wider industrial applications of some of these characteristics.

These " non-conforming " compounds, the professor observes, have long complicated the theories of classical chemists and there has been insufficient study of the observed eccentricities, notwithstanding the brilliant work of Hagg (Sweden), Chaudron, Faivre and Guillaud (France) and Verwey (Holland).

Examples

Using the modern atomic theory of structure as well as the quantum theory as a base, M. Bénard demonstrated, before the Société d'Encouragement pour l'Industrie Nationale, that variable composition compounds exhibit a defined character; their atomic structure may be visualised either by substituting or by inserting ions in a crystalline lattice. For instance, mixed crystals of NaCl + BrCl have a lattice in which the Na ions have kept their usual places and the Cl and Br ions have taken at random the other places reserved either to Cl or to Br ions in the lattice of the corresponding chloride or bromide.

Another example given is derived from the spinels (Fe_3O_4 compounds); there is an actual substitution of Fe_3 by $Al^{\cdot\cdot\cdot}$, $Cr^{\cdot\cdot\cdot}$, etc., ions in the molecule and of Fe_3 by such divalent ions as Mg, Ca, Mn, etc.; even Fe_3 may be substituted by Fe_2 in the spinel molecule.

The appearance of non-stoichiometric combinations of CdO, containing an excess of Cd may be explained by the insertion of Cd ions between the regular ions of the lattice; there is a molecular dilatation. An even more unorthodox result is noticed when NiO is considered; a loss of Ni atoms seems to take place. Prof. Bénard gives the substitution of $Ni^{\cdot\cdot}$ by $Ni^{\cdot\cdot\cdot}$ as an explanation of the observed facts, following the equation:

$3\,Ni^{\cdot\cdot} \rightarrow 2\,Ni^{\cdot\cdot\cdot} + Ni$ (escapes).

M. Bénard boldy concludes that any solid ionic compound is liable to defy Dalton's law. He has added to this purely scientific conclusion a practical development in the form of some contemporary technical applications of non-stoichiometric compounds.

Non-stoichiometric compounds, especially spinels, have, unlike metals, an electric conductivity increasing with temperature increase. Advantage is taken of this in making sensitive instruments for measurements in the infra-red spectra, in controlling thermostats, making thermal safety relay transformers, creating circuits not sensitive to temperature changes and in electronic appliances.

A mixed core of spinel and carbonyl iron will preserve a good permeability and will not sustain heavy losses through eddy currents. Applications of this property are suggested in the transformer, high frequency and permanent magnet industries.

Activators, such as copper, manganese, etc., will excite fluorescence in CdS, $Cdgl_2O_4$, etc, if such activators are substituted in the ion state in the molecular lattice of these non-stoichiometric compounds.

In rectifiers, the part played by CuO may be explained by the non-stoichiometric character of the molecule · which changes CuO into a semi-conductor. In catalysis, the part played by promoters might be explained by their entering non-stoichiometric molecules and replacing ions in such molecules.

A Natural Pressure Vessel

A UNIQUE plant for testing jet units requiring a large supply of high-pressure air is being constructed in Sweden in the rock 279 ft. below the Göta river.

The weight of the river water will be employed, through a shaft, to compress air in a chamber with a capacity of 10,000 cu. m. (353,170 cu. ft.) holding 120,000 kg. of air for use in the laboratory. When emptied the chamber can be reloaded in 18 hours by three suction compressors, totalling 600 h.p., which force the water back into the river.

The chamber can deliver a quantity of air sufficient for a test of 40 minutes' duration with the new types of jet engines now under construction, which consume 50 kg. of air a second.

FLUORESCENT MATERIALS FOR TEXTILES

*Successful Uses in Bleaches and Dyestuffs**

by R. W. MONCRIEFF

MOST fibres are slightly yellow; particularly does this apply to hair fibres such as wool and alpaca. Even with a single kind of fibre, such as sheep wool, the degree of yellowness will vary considerably from one quality of fibre to another, but all are slightly yellowish.

The traditional methods of whitening such fibres are, as pointed out by Edwards[3]: bleaching, loading with a white pigment, and blueing.

Bleaching is indispensable, and even with the introduction of fluorescent optical bleaches it is unlikely that the traditional methods of bleaching, such as treatment of cellulosic materials with hypochlorite and of wool with sulphur dioxide or with hydrogen peroxide, will be displaced. Rather will the optical bleach be used to enhance the whiteness (or the purity of pastel shades).

In some cases, however, although they may be relatively few, the use of an optical bleach will enable a traditional bleaching process to be eliminated, but in the main it seems that at present optical bleaches should be considered as agents to be used to improve the bleach that is normally given. Time may, of course, show that optical bleaches will replace traditional bleaches to a greater extent than now seems likely.

Titanium Dioxide

Loading a fibre with a white pigment is a method not very widely used. It suffers from the disadvantage that a heavy application of pigment may seriously alter the handle of a fabric and may make it wear badly because of the increased friction that results; in addition, the loading may not be fast to washing. The incorporation of a white pigment, such as titanium dioxide in rayon yarns, is rather a different matter; this pigment is fast to washing, but it is applied more to reduce lustre and give a matt or pearl appearance than to whiten the yarn.

Blueing has been carried out in the home and in laundries as well as in the dyehouse. If a fibre looks yellow it is because it reflects more yellow light than the balance of all colours which is required to give a white. If, therefore, a blue pigment is added, this absorbs more and reflects less of the yellow light so that the fabrics appear to be white. Ultramarine is the " blue " that has usually been employed for this purpose. Disadvantages attached to the use of such a " blue " are: The quantity of light reflected by the fibre (or fabric) is reduced, for in addition to the light normally absorbed by the fibre, additional yellow light is absorbed by the " blue." The overall brightness of the fabric is therefore reduced. Sometimes fabrics are overblued; too much blue is applied and the fabric that formerly was slightly yellow becomes noticeably blue, whereas what is required is a good white. The blue is not fast to washing, but has to be re-applied after each wash.

Light Intensity

If, however, instead of applying ultramarine to a fabric, a substance is applied which is colourless but which absorbs ultra-violet light and re-emits it as blue light, the surplus yellowish light reflected by the fabric is neutralised by the added blue light. But this time there is no diminution in the overall intensity of the light reflected by the fibre; on the contrary, there is an increase in the reflected light. All the visible light that was previously reflected by the yellowish fabric is still reflected after the fluorescent substance has been applied to it *plus* the blue light into which the fluorescent substance has transformed the ultra-violet light that fell on it.

These ideas appear to have been first stated by Krais[4] after von Lagorio[5] had previously pointed out that the visible light reflected from fluorescent materials tended to exceed the incident light, and that in the Ostwald system of measuring colour, the white content of the reflected light might be increased by the use of fluorescent dyestuffs.

This apparently suggested to Krais that a colourless fluorescent substance might be used to increase the whiteness of textiles. Krais actually proved his case by applying aesculin (the fluorescent material present in horse-chestnut bark) to textiles, and finding that their whiteness was increased. Aesculin is a glucoside of 6.7-dihydroxycoumarin; it is interesting to note that it belongs to the coumarin family, because β-methyl umbelliferone, which has also been used commercially as an optical blue, is also a substituted coumarin.

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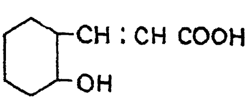
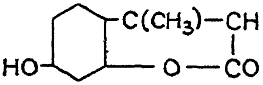
* Continued from page 768, December 3, 1949

Optical bleaches are used in such small quantities that they have no effect on the handle or wearing properties of fabrics. Some of the early examples that were used were not fast to washing, but new substances have been prepared which fluoresce blue and which are also substantive to fibres, so that this difficulty has now been overcome.

Coumarin is the internal anhydride (or lactone) of coumaric acid which itself gives a yellowish-green fluorescence in alcoholic solution:—



Umbelliferone is a hydroxycoumarin and its derivative—methyl umbelliferone—fluoresces blue:—



The application of methyl umbelliferone to textiles was proposed by Lever Bros. *et al*[6] to eliminate the yellowish or off-white tint of textiles. This could be done by treating the fabric or yarn in a very dilute solution of methyl umbelliferone. The writer tried this process on wool and found that it gave a remarkable brightness.

There was not the slightest doubt that the improvement in colour was very substantial; an ordinarily good commercial white wool looked quite dingy compared with the treated wool. Unfortunately, the β-methyl umbelliferone was rapidly removed on rinsing or washing and the improvement in the whiteness was very largely lost on the first wash.

Coumarin

The use of blue fluorescent coumarin derivatives, notably umbelliferone or β-methyl umbelliferone, was also suggested by Lever Bros. *et al*[7] for whitening soap. A further improvement could be effected by using a small amount of a blueing agent as well as the blue fluorescent compound. Thus a white soap of excellent colour was obtained by incorporating in the soap: 0.02 per cent β-methyl umbelliferone; 0.00003 per cent indigo.

Two advantages were derived: the soap was whiter and more attractive; goods washed with the soap would also be whiter. The great disadvantage was that the whiteness was not fast to washing.

Ultrasan was the fore-runner of the Blankophors, which were the first optical bleaches to be used commercially. Its use in paper for wrapping was described by Eggert and Wendt.[8] Originally, it was used as an absorbent of ultra-violet light to protect butter and similar materials wrapped in paper impregnated with it from decomposition due to reactions that were stimulated by ultra-violet light, and so to reduce the tendency to go rancid.

Later it was discovered that Ultrasan would whiten paper and that it had a high affinity for cellulosic fibres. It was manufactured in the period 1938-41 and in 1941 it was also marketed for textile purposes under the name Blankophor B.

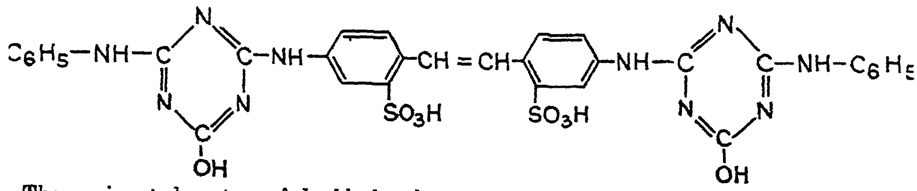
Optical Bleaches

The Blankophors were optical bleaching agents that were developed by I. G. Farbenindustrie before the 1939-45 war, and which were well received and rapidly adopted by the trade. Their manufacture was later discontinued owing to the exigencies of the war, but at least one member of the series of compounds has again been produced, since the termination of the war. Their history, manufacture and use have recently been described.[9] They were fluorescent materials, which when applied to textiles or to paper increased the total amount of reflected light; they were colourless—an essential characteristic of optical bleaching agents—and they were fairly fast to washing.

They were, however, not quite perfect, although they were sufficiently good to secure wide adoption. The defects from which they suffered were: They did not fluoresce satisfactorily in artificial light. But it should be added that if artificial light fluorescence is to be regarded as a criterion for a satisfactory optical bleaching agent, it is one that will be very difficult to meet, because most fluorescence is due to the action of ultra-violet light, and artificial light as commonly used is only very poor in ultra-violet. They did not show satisfactory stability when directly exposed to the sun.

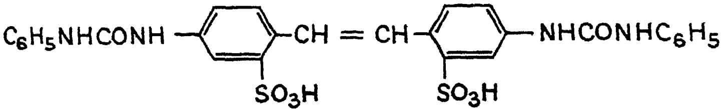
Four kinds of Blankophor were made and used. They were as shown below.

In the concentrated form it was identical with Ultrasan. It was diluted with urea (10 Blankophor B Conc. 90 urea) and sold as Blankophor B. Its active constituent had the formula which is printed at the top of facing page.



The conjugated system of double bonds, to which the fluorescent properties are due, may be noted. All that was necessary to treat cotton with it, was to immerse the cotton in a 0.1 per cent solution of Blankophor B, using a 30:1 volume ratio. The Blankophor was fairly fast, *e.g.*, after four rinses each of 15 min. in cold water only about 13 per cent of the Blankophor was removed, and even after boiling for half an hour in soap and soda solution only about another 14 per cent was removed. The fastness of Blankophor B to light was about 4 (maximum 8), which is moderately good.

Blankophor R is a substance which appears to have been made and used because one of the intermediates required for the manufacture of Blankophor B was unavailable during the war period. It had the constitution:—

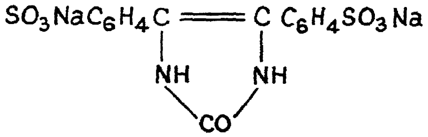


and was sold as a 7.4 per cent dispersion in urea. It fluoresced purple and was inclined to give the fabrics a reddish tinge. Once again the conjugated system of double bonds is evident.

Blankophor R G was designed to overcome the reddish tinge of Blankophor R; it consisted of Blankophor R Conc. to which 2½ per cent Anthranal Green G G Conc. was added. The green dye neutralised the reddish tinge and was thought also to improve the appearance of treated fabric where examined under artificial light. This is the blend which has been sold since the war ended.

Water-Solubility

Blankophor W T was intended for application to wool and silk; the other Blankophors had a marked affinity only for cellulosic fibres. It was known that the condensation product of benzoin and urea had some of the properties required in an optical bleach for application to wool, but it lacked water-solubility. Accordingly, it was sulphonated and thus made water-soluble, and was adopted for use with wool in 1942. It is the sodium salt of diphenylimidazolene disulphonic acid:—



Blankophor W T had a light fastness of 4-5, which was fairly satisfactory. It was applied to wool as about a 0.05 per cent solution, using a 50:1 volume ratio for 15 min. at room temperature. It was essential for the bath to contain about 0.05 per cent formic (or sulphuric) acid. It had an affinity also for nylon. In addition to being used to improve the whiteness of whites, Blankophor W T was also used to improve the contrast of prints and also as a laundering asistant. In the latter case it was added to the last rinse. It was not stable to chlorination, but as it is more likely that it would be applied after than before a non-shrink treatment, this may not be a serious detriment to it.

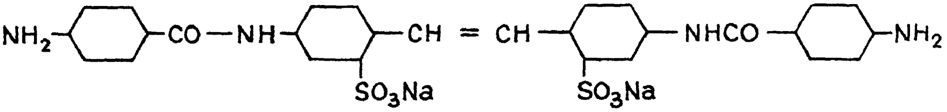
The application of the Blankophors was discussed by Michel.[10] He stated that Blankophor B is suitable for bleached cotton, semi-bleached linen, and slightly bleached or unbleached staple rayon and rayon.

The Lumogens comprised a group of fluorescent water-insoluble pigments intended to have practically the same colour in ultra-violet as in daylight. They were used for colouring maps, etc., which could be read at night by ultra-violet light, *i.e.*, they could be read in the dark. Because of their close relation to optical textile bleaching agents, it seems advisable to mention them here.

Two members, Lumogen Blue (2-5 dihydroxy terephthalic acid ester of ethyl alcohol) and Lumogen Water Blue (dixanthylene), were nearly colourless and had a blue fluorescence, but owing to their water-insolubility could not be used in a similar way to the Blankophors. If applied to cellulose acetate from organic solution the product " showed startling brilliance."

The use of methyl umbelliferone had been advocated by Lever Bros. *et al*, who had shown also that its efficacy was even greater in the presence of a small amount of a blueing agent such as ultramarine, but its defect of too ready water-solubility combined with lack of substantivity for the fibre rendered it unsuitable for many purposes. Water-solubility is not a defect provided that a substance has an affinity for the fibre, but if it has no such substantivity and is also very water-soluble it washes out too easily.

This defect was remedied in B.P. 584484.[11] In this specification there was described a range of blue—fluorescent substances which had a substantive affinity for wool, and which accordingly were fast to washing. These included a range of diaminostilbene sulphonic acid derivatives. Typical of these is 4,4′-di-*p*-amino benzoylamino stilbene 12,2′-disulphonate :—

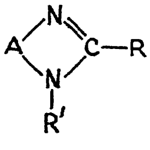


The range included some derivatives of benzidine and of benzothiazol. The intention was to add the blue-fluorescent agent in small proportion to the soap, and then when wool was washed with the soap the blue-fluorescent agent would dye on to the wool. It was reported that when quantities of fluorescent agents of the order of 0.02 per cent were incorporated in the soap, and textile materials were washed in a 0.4 per cent solution of the soap and rinsed at least twice in clear water, " the finished materials were of a much whiter and brighter appearance than similar materials laundered in a control test."

The addition of similar fluorescent materials to the textile treating bath directly instead of incorporating them in the soap, was suggested in B.P. 584436. It was later reported by the same inventors[12] that stilbene derivatives, such as that described above, suffered from two disadvantages: they were detrimentally affected by sodium hypochlorite and similar solutions that might be used in laundering for the removal of stains: they discoloured on long exposure to light.

It was stated that if the terminal—NH_2 groups of the stilbene derivative were converted into—$NHCONH_2$ groups, as in the compound 4.4′-di-*p*-ureidobenzoylamino-stilbene-2,2′-disulphonate, these defects were avoided. The use of these ureido-compounds appears to have been recommended chiefly for cellulosic material.

The preparation and use of cyclic amidines which exhibit a blue to violet fluorescence has been described by Graenacher, Ackermann and Ciba. Ltd.[13] in U.S. Patent 2463264. According to this, in cyclic amidines of the general formula :—



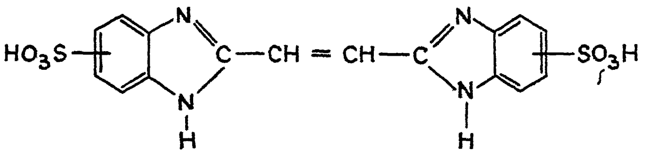
A represents an aromatic nucleus, R′ represents H or a substituent, *e.g.*, benzyl or a hydroxyalkyl radicle, and R represents an alkyl radicle preferably unsaturated in the $\alpha:\beta$ position or various other substituents. Such substances are preferably sulphonated to give water-solubility, so that they may conveniently be used in the form of aqueous solutions.

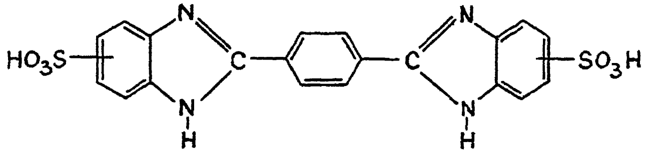
Typical compounds which accord with this specification are the disulphonic acids of the formulæ shown at top of facing page.

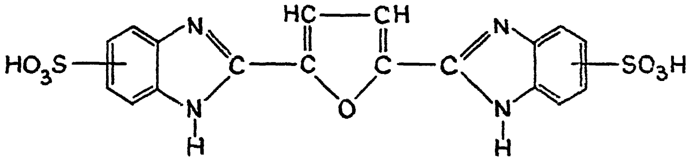
It will be seen that all these three substances are similar except for the group which joins the two cyclic amidine groups and which is respectively in ethylene, phenylene, and furylene. It may be noted, too, that in each case this group forms a series of conjugated points of unsaturation with the amidine nuclei. The blue-violet fluorescence of these compounds appears to depend on the presence of such a series of conjugated double bonds.

Such substances, although rather complex in structure and requiring complicated syntheses, are very simple to apply. If, for example, bleached cotton yarn is treated for 30 min. at 20° C. in a bath containing about 0.2 gm. per lit. of the sodium salt of the substance 2, which is 1 :4-di-[benzimidazyl-(2′)]-benzene in a 50 :1 liquor ratio, and is then rinsed and dried, its whiteness is much improved; it is said to possess " a higher white content " than the untreated material.

This is, of course, due to some of the ultra-violet light which falls on the treated fibre being converted to bluish visible







light, which not only neutralises any yellowish or brown discolouration of the fibre, but also increases the total quantity of visible light that is reflected by the fibre.

Although every one of the many examples given by Ciba, Ltd., in this paper relates to the application to cellulosic materials of the fluorescent materials, it is stated that they may also be applied to wool, silk or synthetic polyamides. The unvarying choice of cellulosic materials in the examples suggests that the affinity of these fluorescent compounds is greatest for cellulose, and that the fastness on wool may not be good.

Not only can these compounds be used to improve the whiteness of white materials, but they may also be used to give much better contrast on prints. If, for example, a two-colour print is treated with one of the fluorescent agents, the whiteness of the white parts will be greatly improved so that the print gains in clarity, contrast and brightness.

Rhodamine Dyestuffs

It seems clear that if a dyestuff of one colour could be used in conjunction with a material which fluoresced in the same colour, a much brighter shade should result. The Rhodamine dyestuffs are themselves flourescent, and when dyed on wool will give (with Rhodamine B) a pink of superlative purity, due doubtless to the augmentation of the reflected by the re-emitted light. Unfortunately, these dyestuffs are not very fast to washing. The writer was able to produce good bright pinks by using a faster dyestuff, such as Kiton Red G, in conjunction with a very small quantity of red-fluorescing agent. Various derivatives of fluorescein were tried.

Fluorescein is itself a dyestuff but finds little application as such because of the fugitiveness of its dyeings on wool. Its sodium salt is highly fluorescent and is marketed as Uranine. Its halogenated derivatives include eosin, which is potassium tetrabromofluorescein, and erythrosine, which is the disodium salt of tetraiodofluorescein. Either of these wll give brilliant pinks or reds when dyed on wool, but they are so fugitive to light that the colour is noticeably faded after an exposure of only half an hour.

A Brighter Pink

It was found that if a very small quantity of erythrosine was added to a Kiton Red G bath, wool dyed pink in it was very much brighter and purer than usual, but unfortunately the erythrosine was fugitive, and on exposure to light or to washing the increased brilliance of colour diminished. There are, however, other substances that fluoresce red, and a search for one that was fast to light and had substantivity for wool might be rewarded.

A somewhat similar principle, that of augmenting the shade of a dyestuff by a fluorescent materal which emits light of a similar colour, is involved in the addition of a fluorescent pigment in rayon yarn, described below.

Advantages are claimed for the incorporation of a fluorescent pigment in rayon yarns, particularly those of cellulose acetate, by British Celanese, Ltd., in a recent patent.[14] It is stated that the pigment in a very fine state of division is preferably introduced into the dope at a point near the spinning jet, so that only the minimum part of the spinning system will become contaminated with the pigment.

If a pigment which has a reddish fluorescence is incorporated and then the yarn is subsequently dyed red with a red-fluorescent dyestuff, the combined fluorescence from pigment and dyestuff give an exceptional brilliance of shade and intensity of colour. An example suggests the use of 4 per cent zinc sulphide on the weight of cellulose acetate, followed by dyeing with Rhodamine B in the presence of formic acid. The fabric so dyed and then finished "exhibits a brilliant red colour when viewed under daylight and an intense brilliant red colour when illuminated by ultra-violet light."

Suitable Pigments

According to the colour that the yarn is to be dyed, one of the following pigments should be used: red—zinc sulphide or mercuric oxide or Rhodamine BX tungstate lake; blue—peacock blue lake; green—zinc sulphide suitably prepared of a green daylight colour or brilliant green tungstate lake or malachite green tungstate lake; violet—ethyl violet tungstate lake.

Suitably fluorescent dyestuffs are: For cellulose acetate—Alizarin blue SAPX (C.I. 1054), Rubine A W (CI. 677), Alizarin green C G (C.I. 1078), Rhodamine 6 G (C.I. 752), Auramine O (C.I. 655), Thioflavine T (C.I. 815), Calconese fluorescent yellow, Calconese invisible blue, and navy blue R (C.I. 922 and 680). For cellulose—Chlorazol yellow 2 GS, Immedial yellow G. G. (C.I. 955), Primuline A S (C.I. 812), Oxamine red BN, Thiazone red 6XX, Thioflavine S (C.I. 128). For polyamides, *e.g.*, nylon—Rhodamine B (C.I. 749), Milling orange C, Milling red C, ink blue G (C.I. 707).

In a similar connection, it is interesting to note that Arkin and Singleterry[15] have shown that certain dyes which are not ordinarily fluorescent will fluoresce if adsorbed on an oil-dispersible metal soap. This behaviour is expected to be taken advantage of in the development of fluorescing agents.

It seems to have already been clearly established that brilliant whites can be obtained by the use of optical bleaching agents. Fabrics that have been treated with these reflect more light than falls on them: whereas traditional blueing agents inevitably reduce the overall brightness, these new optical agents increase it.

Several of these agents are already on the market; the Blancophors were the first to be used commercially, and Tinopal B V made by the Geigy Co., Ltd., has been in use for some years. Others have recently made their appearance and as a class they should be sure of increasing use. Pastel shades of greater purity are obtainable by their use owing to the reduction of the flattening effect of the yellowness of the natural fibres.

Probably, too, a new range of fluorescent materials will be developed which will augment the colour of dyestuffs, and these should result in the production of textiles in colours more brilliant than have yet been seen.

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(Concluded)

Commercial Supplies of Indium

THE Consolidated Mining and Smelting Company of Canada has announced the addition of indium to its list of products. Although this is one of the rarer metals, it is now available in commercial quantities, the result, it is said, of prolonged research at the company's works at Tadanac, British Columbia. The large-scale operations at Tadanac have made it possible to recover and refine indium from the minute quantities present in the ore from the Sullivan mine. All the metal produced will be of 99.99 per cent minimum purity.

Several of the large mining companies in the U.S.A. are producers of indium, but its limited use has been confined to dental work, some kinds of plating, as a non-tarnishing agent on silverware, and for motor bearings. During the war, certain high speed aeroplane motor bearings were indium-treated. The Consolidated Company hopes by further research and development to broaden the field of possible utility of this metal.

LIQUID ROCKET FUELS

Problems of Handling Demand Special Materials

THE chemistry of rocket fuels, and the problems involved in handling such highly oxidisable materials, were discussed by Dr. J. G. A. Griffiths, chairman of the London and South-Eastern Counties section of the Royal Institute of Chemistry, in an introductory talk prior to the showing of the films " Operation Back-fire " and " Rocket Flight," at a recent meeting.

The fuel might be liquid or solid, said Dr. Griffiths; in the first case, a number were available, such as alcohol and liquid oxygen, petrol and liquid oxygen, liquid hydrogen and liquid oxygen, or liquid hydrogen and liquid ozone. Exhaust velocities of 4000-5500 metres per sec. were possible with these fuels, but liquid ozone, although having some advantages over other oxidisers, was unstable and explosive.

Solid fuels gave lower exhaust speeds, and for certain purposes were less suitable than liquid fuels. Liquid fuels were more controllable—for example by adjusting the rate of mixing—than were solid fuels which burned at a rate which was a function of the material and of the physical form. However, liquid fuels had set problems of high speed pumping which had been solved.

As materials of construction, substances which were light, strong, heat resistant (high m.p.) were needed, and special steels were used. Graphite was good from all points of view except strength. Graphite control vanes were used in the German long-range rocket A-4 (also known as V-2), in which they were sited in the actual hot exhaust.

The fuel in the A-4 was alcohol and liquid oxygen. The fuel pumps were driven by steam turbines for which the steam was raised by the action of 85 per cent hydrogen peroxide on sodium permanganate. The chemical problems of production of 85 per cent peroxide, including concentration of the then usual 30 per cent material, storage and handling problems were tricky, but were overcome; for example, glazed earthenware or aluminium were employed.

The Germans also discovered the need to avoid contamination of the concentrate with even small amounts of Fe, Cu and other ions which cause decomposition, Various stablisers, such as phosphates, 8-hydroxyquinoline, etc., were used. Finally, a product was obtained that only lost 1 per cent strength in one year at ordinary European temperatures.

Dr. Griffiths mentioned, as a matter of interest, the amount of sodium permanganate used in the A-4 was 29 lb., the amount of liquid fuels was about 9 tons, including 5 tons of liquid oxygen, the fuel pump could operate at 680 h.p. for 110 sec., the range was about 200 miles, and the speed of the order of 3000 m.p.h. The maximum height was about 50 miles.

Reference was made to self-firing fuels —a mixture of methanol and hydrazine oxidised with 85 per cent hydrogen peroxide, for example—and to the possibility of interplanetary travel by rockets which shed their used fuel tanks.

Quantity Production of Hydrazine Hydrate

IN a note announcing that a member of the group has just completed a plant to make hydrazine hydrate, British Chemicals & Biologicals, Ltd., supplies an interesting commentary on the fresh scope which this foreshadows. Recalling that, since its isolation in 1887, hydrazine hydrate has remained a chemical curiosity, the note observes that it is now a commercial chemical with great possibilities. Probably the most useful property of hydrazine is its powerful reducing action, liberating nitrogen and water only as end products of the oxidation.

Hydrazine may be used in the manufacture of various organic chemicals and dyestuffs, in the preparation of a blowing agent for the plastics and rubber industries and for the production of fibre-forming polymers. It has many other applications—in metal deposition and refining and preventing oxidation.

In Germany, hydrazine was used in conjuction with hydrogen peroxide and other oxidising agents as a propellent fuel for " V " weapons and torpedoes.

It is indicated that the new supply is now available in tonnage quantities, of 60 per cent concentration. Hydrazine sulphate, hydrobromide, hydrochloride and nitrate are also being manufactured, and 90 per cent and 100 per cent hydrazine hydrate are available in research quantities.

PRODUCTION OF SISAL WAX

New British Process Described

FULLER information has now been provided in the new British patent literature on the original proposals for the recovery of wax from sisal leaves pioneered by the A.S.P. Chemical Company, of Gerrards Cross (THE CHEMICAL AGE, *60*, 7). The methods are summarised in patents numbered 630,270 and 630,271 which have been assigned to the company. The application date for both is January 15, 1947.

Solvent Extraction

The first of these claims an improved process for the extraction and purification of sisal wax. The sisal flesh is first contacted with an organic solvent, such as a mixture of benzene and ethyl alcohol, or trichlorethylene, at a temperature approximately the boiling point of the solvent, to extract the wax and other substances. The resulting products are treated with an absorbent, comminuted or not, to eliminate impurities. The solvent is then distilled off. The solvent reflux principle may be used with continuous distillation and leaching of the sisal mass with fresh solvent.

After addition of absorbent to the hot wax solution, the whole mixture is subjected to hot filtration and the purified wax filtrate recovered. This is then distilled. The absorbent may be charcoal, activated carbon, alumina, bone meal, etc. It may be used in various ways; in one example, the solution is passed through a heated column containing alumina.

Solid Deposits

The second patent No. 630,271, is broader in its title and comprises the recovery of wax from plant leaves or flesh generally, especially of sisal, hannequin, flax, jute and others. Its subject matter, however, is concerned with sisal only, and is very similar to the other.

The proportion of solvent to material treated may in some cases be 5: 1. The main steps consist, as before, in contacting the leaves or flesh with an organic solvent at the boiling point, or just below it, of the solvent. The solvent is distilled off, or the solution cooled to deposit extracts. The residue left after distillation or the deposit resulting from cooling is re-dissolved in the same or similar solvent. The solution may be mixed with absorbent before filtering. Both the process and product are protected by the patent.

PETROLEUM CHEMICALS

British Celanese Contribution

IN his report to the shareholders at the recent 30th annual general meeting of British Celanese Ltd., Mr. G. H. Whigham (chairman) referred to the heightened interest shown during the year in the establishing in this country of chemical industries based upon petroleum. He recalled their own oil-cracking installation, which was primarily erected for the provision of some of the basic materials required for their main products, had now been operating for a number of years and their research staff had made a number of contributions to the rapidly accumulating knowledge of this technique.

In the U.S.A. the requirements of the cellulose acetate industry in acetone and acetic acid had hitherto employed the largest proportion of organic chemicals made from petroleum. At the same time, the wider potentialities of this rapidly developing source of raw materials were being actively explored by British Celanese. Its scientific staff realised the importance of keeping abreast of world discovery in their long-term research. In the textile section, steady progress had been made in the improvement of existing processes, both by the adoption of modified techniques and the installation of new machinery, some of which they designed and constructed themselves.

The company's interest in plastics had continued, mainly in cellulose derivatives, and during the year several new uses and methods of application had been developed. The extension of cellulose acetate and chemical plant at Spondon embodied in the company's general expansion scheme was nearing completion.

Castor Oil for Paint Making

PROGRESS in the process to substitute castor oil for linseed oil in paint and varnishes manufacture is reported in *Indian Trade and Industry* (*1*, 308). The work has been carried out at the Central Research Laboratories, Hyderabad city. Using dehydrated castor oil and local earth as a catalyst, oil with improved drying properties is claimed to have been produced.

Paints and varnishes thus made have greater retention of colour and higher resistance to water, states a research worker of the institute. The discovery is of great significance to Hyderabad, which accounts for about 85 per cent of India's production of castor oil seeds.

CHEMICAL MARKETS IN AUSTRALIA

Degree of Dependence on Outside Sources

DESPITE a rapid growth of the chemical industry during the war, imports of chemicals play an important part in the economy of Australia.

Fertilisers are one of the major items, although local plants supply a proportion of the demand for superphosphates and sulphate of ammonia. Imports of fertilisers in 1948-49 were valued at £A2.5 million, the main sources of supply being Canada and the United Kingdom.

Other important items in the chemical group include textile and other dyes which, although now being locally produced in increasing quantities, are not yet sufficient to meet all requirements; industrial chemicals used in the manufacture of steel, glass, and plastics for which there is a steadily increasing demand; essential oils, insecticides, drugs, medicinal and toilet preparations.

Since 1940 there has been a considerable increase in the domestic output of pharmaceutical products such as caffeine, insulin, penicillin and the sulpha drugs, but imports still remain high and the U.S.A. the principal supplier.

Imports of rubber during 1948-49 were worth over £A6 million; two-thirds consisted of crude, waste and masticated rubber, and the remainder of finished manufactures, including elastic, rubber thread and pneumatic tyres. Tariff protection made possible the development in Australia of the manufacture of tyres, belting, hose and footwear.

Mineral Oils

Australia is almost entirely dependent on imported petroleum. Peace-time consumption of mineral oils averaged 600 million gallons a year but rose as the war-effort intensified to a peak of 860 million gallons during 1943-44. In 1948-49, imports of petroleum, kerosene, lubricating, residual and solar oils, which were valued at £A37,340,000 (nearly four times the 1938-39 figure), represented a heavy drain on Australia's financial resources.

Further efforts to recover oil on a commercial basis either within the Commonwealth or the adjacent islands of New Guinea, Papua, and Timor are likely to be made. Australian refineries concentrate on the processing of by-products, as all motor and aviation oil is imported in a refined state.

Crude aluminium is not at present produced in the Commonwealth, but its use has expanded greatly in the country in recent years. In contrast to pre-war, she now has a rolling-mill industry,

Imports, to-day, mainly in the form of ingots and blocks, as opposed to the plate and sheet of pre-war years, were valued at £A1,324,000 in 1948-49 in comparison with an annual average of £A203,000 between 1935 and 1939. The ingots and blocks, imported from Canada, are rolled in the new Sydney and Wangaratta mills.

Tasmanian Production

From being an importer of aluminium, Australia plans to become an exporter on the completion of the Government-sponsored Aluminium Production Commission's project to install plant with an ingot capacity of 10,000 tons a year, utilising local deposits of low-grade bauxite and alunite and hydro-electric power resources. Production is expected to commence in Tasmania in 1950. Potential home demand for aluminium, which did not exceed 1000 tons a year before the war, is not likely to absorb the maximum output of this plant, even if there is a large-scale replacement by aluminium of materials at present used in Australian manufacture.

Australian Wool Chemistry

A FURTHER step in the Australian Commonwealth Government's long-term research programme on wool textiles was taken recently when the minister in charge of the Australian Scientific and Industrial Research Organisation, Mr. J. J. Dadman, announced that two additional textile research laboratories were to be set up, one in Sydney, the other in Melbourne.

The proposed Melbourne laboratory will house the biochemistry unit, which will study the chemical structure of wool. The Sydney laboratory will contain the physics and engineering unit, which will undertake research on wool fibres and the engineering problems involved in processing. The existing Geelong organisation is concentrating on research into established processes and the development of new processes based on the results achieved by the whole group of laboratories.

◆ HOME ◆

Telephone Calls to Turkey

A telephone service has been opened with Turkey. The minimum charge for three minutes is 35s.

Industrial Disputes

It has been officially stated that the number of man-days lost by strikes during the first ten months of 1949 was about 790,000 working days in nationalised industries and 875,000 in other industries.

Liverpool Agency for Export Credits

The Export Credits Guarantee Department has opened a new office at 14 Castle Street, Liverpool 2, under the managership of Mr. E. J. Jackson. The telephone number of the new office is Liverpool CENtral 5756-7.

Prices of Oils and Fats

It is officially announced that no change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four-week period ending December 31.

Rubber Group Award

The programme for yesterday's (Friday) dinner following the 28th annual general meeting of the Institution of the Rubber Industry included the presentation by the newly-elected president, Mr. Herbert Rogers, of the Colwyn medal for 1949 to Mr. E. A. Murphy, manager of the general development division of the Dunlop Rubber Co., Ltd.

National Titanium Pigments

A news item in this page last week (*61*, 783) incorrectly stated that National Titanium Pigments, Ltd., was to build a large factory at Kingsway, Luton, Bedfordshire. National Titanium Pigments, Ltd., whose headquarters are at Kingsway, Luton, states that no factory for the company is being built there. The company intends to start building a new plant in North Lincolnshire next spring.

New Power Plant

A steam-generated electric power station is to be constructed at Capenhurst which will make the Wirral and Dees-side area one of the greatest power producing centres in the country. The plant, which will supply power for the atomic energy development scheme, will be of the size and calibre of that being erected at Bromborough, for £9 million, and is expected to be completed and in operation by 1953.

Aid for Cancer Campaign

The British Empire Cancer Campaign will benefit from Liverpool University Chemical Society's annual concert given on November 24 and 25 at the University Students' Union.

Anthracite for Dollars

Export of anthracite to the U.S.A. from Britain, which ceased during the war, has begun again. A cargo of 3500 tons of South Wales anthracite has recently been sold for shipment to Boston, and two further cargoes are being negotiated.

Soap Import Regulations Relaxed

Imports under block licensing arrangements of certain types of soap will be permitted as from January 1, 1950, states the Ministry of Food. This will benefit exporting countries other than those excluded from the scope of the Board of Trade's notice No. 336, dated September 29.

Coal Output

Production of deep-mined coal in Britain last week reflected the customary pre-Christmas wages drive; it was the highest this year. Comparative figures are:—Last week: Total output 4,572,100 tons (deep-mined 4,355,000 tons, opencast 217,100 tons); week ended December 4, 1948: 4,341,700 tons (deep-mined 4,147,600 tons, opencast 194,100 tons).

Analysing a Meteorite

Prof. F. A. Paneth, professor of chemistry at Durham University, has signified his intention, with the help of three other scientists, to take measurements of the helium, uranium and thorium content of the meteorite which recently fell through the roof of an hotel at Beddgelert (Caernarvonshire) The study will add to the small amount of data now available for calculating the age of such objects.

Wool Grease Recovery

By arrangement with Mr. Maurice Webb, M.P. for Bradford Central, a film on wool grease recovery was shown under the auspices of the Parliamentary and Scientific Committee on November 29 in the Grand Committee Room, Westminster Hall, Palace of Westminster. The film is a pictorial record of the experiments of Bradford Corporation in the recovery of wool grease from the sewage of the city and the production from it of a series of important chemical by-products.

Technical Publications

QUESTIONS covering the supply of and demand for qualified people in the chemical industry are discussed in a report published this week by the Stationery Office. This is one of 12 reports on employment in the science and engineering professions, prepared for the Ministry of Labour and National Service by a number of panels appointed by the Technical Committee and presided over by Lord Hankey, of which five are now released. Other reports to be published later will refer to chemical engineering, metallurgy, and biology.

* * *

RESEARCH work carried out in the Shell laboratories on a variety of products suitable for replacing pine tar in rubber compounding resulted in the development of Dutrex R, a non-volatile petroleum derivative which is fully described in a booklet issued by Shell Chemicals, Ltd., London. It is claimed to be an efficient plasticiser and softener in natural rubber and to improve processing and add to the physical properties of the vulcanisate.

* * *

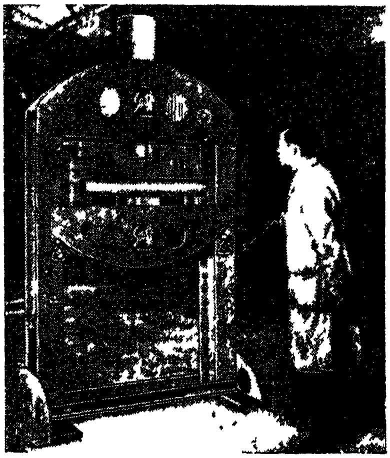
THE function of iodine as an essential part of nutrition of man and animals is discussed in some detail in "Iodine Facts" (Nos. 381-429) published by the Iodine Educational Bureau. It gives a comprehensive survey of goitre in animals and various preventive measures.

* * *

MEANS of quickening the rate of output while saving in man-power are discussed and illustrated in "Mechanical Handling To-day," a new booklet by The Chloride Electrical Storage Co., Ltd. Many examples are quoted to prove the advantages of battery-operated electric trucks in works and factories.

* * *

INVESTIGATIONS carried out on sinter alumina and the main factors affecting its usefulness, with particular attention to the chemistry of reaction in the solid phase and the orientation, growth, and general characteristics of the crystallites, are described by Dr. Felix Singer in "Sinter Alumina as Engineering Material for Cutting Tools and Turbine Blades." The author also draws attention to the increasing applications of sinter alumina components. The article, which is now issued in booklet form, is reprinted from *Ceramics* (Vol. 1, Nos. 5 and 6, 1949).



[Courtesy, Chamberlain Industries, Ltd.

Useful for many kinds of assembly work, this new Staffa 50-ton hydraulic Arbor press is also suitable for pressing, straightening, riveting, bending and clamping. The machine, designed by Chamberlain Industries, Ltd., Leyton, London, E.10, includes an automatic pressure release on the control valve to prevent overload

VARIOUS British Standards covering aluminium and aluminium alloy ingots and castings have now been combined into a single schedule recently published as B.S. 1490 : 1949—Aluminium and aluminium alloy ingots and castings for general engineering purposes.

The new schedule also includes specifications for ingots and castings not previously covered by British Standards.

The system of nomenclature, adopted accords with that in the recently issued B.S. 1470 for wrought aluminium and aluminium alloys sheet, strips, etc. The standard is concerned with aluminium of 99 per cent purity and 20 different alloys, each in the form of ingots and castings.

Details are also given regarding certification of compliance with the standard, independent tests, the provision of test samples and inspection procedure.

A few copies of this standard distributed before October 3, 1949, contain a printers' error in referring to alloy LM-6-M. Those copies should be returned. The new publication is 7s. 6d., post paid.

BAC PRESIDENT

Dr. Levinstein to Serve Again

DR. H. LEVINSTEIN was elected president for a second term of office at the 32nd annual general meeting of the British Association of Chemists, held in London last Saturday. Tribute to the doctor's keen interest in the association was paid by Mr. Norman Sheldon, who has served as president for the last three years.

An important offer by an insurance company to members was referred to in the council's report for 1948/49. Special facilities were offered at low premium, and the holder of the policy, if transferred for any reason, could take it to his new firm, which in effect rendered it a transferable pension scheme.

There had been an increase in membership during the year, the total now being 2218.

The good work of the general secretary, Mr. C. B. Woodley, who will shortly have completed 25 years' service, was particularly referred to and it was agreed that a presentation should be made shortly as a mark of the association's esteem and appreciation.

The Hinchley Medal was presented to Miss Winifred Wright, who has been an active worker on behalf of the association since its inception. She has served on many committees, and is one of the founders of the unemployment scheme.

Royal Society Officers

AT the 287th anniversay meeting of the Royal Society, held in London on November 30, the following were elected as officers and council for the ensuing year:—President: SIR ROBERT ROBINSON, O.M. Treasurer: SIR THOMAS MERTON; Secretaries: SIR EDWARD SALISBURY, SIR DAVID BRUNT; Foreign Secretary: PROF. E. D. ADRIAN, O.M. Other members of Council: BRIGADIER R. A. BAGNOLD, PROFS. G. L. BROWN, H. DAVENPORT, and F. G. GREGORY, SIR CYRIL HINSHELWOOD, PROFS. R. P. LINSTEAD, G. F. MARRIAN, H. S. W. MASSEY and F. E. SIMON, SIR WILLIAM STANIER, SIR GEORGE THOMSON, DR. H. G. THORNTON, PROF. C. E. TILLEY, DR. F. M. R. WALSHE, DR. V. B. WIGGLESWORTH, PROF. S. ZUCKERMAN.

DR. S. DEVONS has been appointed to the recently instituted London University chair of physics at the Imperial College of Science and Technology.

PETROLEUM IGNITED

Cause of I.C.I. Fatality

THE unauthorised use of an electric stove in a storeroom at the Winnington works of I.C.I., Ltd., was stated at the inquest at Northwich on November 30 to have been the cause of the death of George Mills, aged 54, of Weaver Park, Northwich, who died from shock following extensive burns received while at work. A verdict of Misadventure was returned. It was stated that Mills was in a storeroom in the electrical department when a tray containing petrol fell from a shelf and became ignited by the electric stove. Mills ran out of the room enveloped in flames. John Henry Lewis, of Waterloo Road, Northwich, assistant technical officer with I.C.I., said it was against the regulations for an open stove of any kind to be used in a room where petrol was stored. The coroner (Mr. R. A. Daniel), said the evidence showed that when petrol was returned to the storeroom it was the practice for Mr. Mills to put it in a container. On this occasion he failed to do so.

Disputed Cause of Pollution

THE difficulty of distinguishing with certainty the source of pollution of a waterway was illustrated during the hearing at Pwllheli on November 30 of summonses relating to the alleged release by Southern Caernarvonshire Creameries, Ltd., of milk effluent into the River Erch. Fish were killed and, according to the Chester public analyst, two samples of water contained 0.1 per cent dissolved oxygen, and none. The Liverpool city analyst and a bacteriological analyst disagreed with the Chester analyst's conclusions and attributed the pollution to a neighbouring sewerage outfall.—The defendant company was fined £15 and ordered to pay £17 7s. costs.

Borax and Boric Acid Prices

BORAX Consolidated, Ltd., and Borax Chemicals, Ltd., advise the following reduced prices, to apply on and after December 1:—Granular borax technical (commercial) quality £35 10s.; granular boric acid technical (commercial) quality £63; anhydrous borax £55, net per ton delivered buyers' address in Great Britain in 1-ton lots and upwards, with the usual surcharges for smaller quantities. Prices for technical crystal and powder and B.P. quality are unchanged.

· PERSONAL ·

SIR GRAHAM CUNNINGHAM, chairman and managing director of Quickfit & Quartz, Ltd., has resigned his voluntary post as chairman of the Dollar Exports Board. In a statement last week, Sir Graham said that he had resigned on November 9, but would make no comment on his reasons, which he had given to the board. He would, however, continue to give its members all the help he could. SIR CECIL WEIR, former British Economic Advisor in Germany, has been appointed in his stead.

The Mond Nickel Fellowships Committee has made awards for 1949 to MR. J. MONAGHAN (Stewarts & Lloyds, Ltd.) to study the method of control and administration of basic open-hearth operation and practice in the steel industry in the U.S.A., and to MR. R. STEWARTSON (United Steel Companies, Ltd.) to study the design and operation of modern hot rolling mill plant in the U.S.A.

MR. EDGAR W. HOLMES has been presented with a gold wristlet watch in appreciation of his 30 years' service as works chemist with John W. Leitch & Co., Ltd., Milnsbridge Chemical Works, Huddersfield. Dr. A. E. Everest, managing director, made the presentation.

SIR EDWARD APPLETON, SIR LAWRENCE BRAGG and PROF. ANDREW ROBERTSON will be the speakers on the place of technological education in university studies at the 1919 Conference of the Universities of Great Britain and Northern Ireland on Friday and Saturday (Dec. 16 and 17).

COLONEL L. C. HILL has been elected president of the Institution of Mining and Metallurgy for the session 1950-51, and will take office on May 18, at the annual general meeting. Col. Hill has long been associated with the Spanish Rio Tinto Company.

MR. J. W. COLE was re-elected president at the annual general meeting of the Paint Research Association held in London last week.

MR. WILLIAM H. HOOVER, a 60-year-old Butte, Montana, lawyer, has been elected president of the Anaconda Copper Mining Company, one of the world's largest copper producers. Mr. Hoover succeeds the late Mr. James R. Robbins, who died on November 14 while on a business trip to Butte.

Mr. L. W. Blundell

MR. S. ROBERTS, products salesman of the North Thames Gas Board, retired on December 31, after more than 50 years' service. MR. L. W. BLUNDELL, superintendent of the Board's products works, has been appointed controller of by-products as from January 1, and will become responsible for the manufacture and sale of all the Board's chemical by-products. Mr. Blundell achieved early distinction in chemical engineering at the Imperial College of Science, which was recognised by the conferment of the D.I.C. and the M.Sc., and later as a research chemist in the iron and steel industry he received the Junior Moulton Medal of the Institution of Chemical Engineers. He joined the Gas Light & Coke Company as a chemical engineer in the tar and ammonium products works in 1929.

SIR W. ARBUTHNOT LANE, managing director of Kaylene, Ltd., has been appointed by the Home Office to be Commandant-in-Chief of the Metropolitan Special Constabulary. He joined the force in 1926 as a constable.

Obituary

MR. BERNARD R. ARMOUR, president of the American Aniline Products, Inc., and the Heyden Chemical Corporation, and director or executive of many other companies, died in New York on December 1, at the age of 58.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

A $60 million refinery, to be known as the Eagle Point Works, with a rated capacity of 40,000 barrels of crude oil daily, has been placed in operation at Westville, New Jersey, by the Texas Company, representing Texaco's first installation of refining facilities on the East Coast. The new refinery will handle principally crudes from Arabia and Venezuela and is stated to be capable of yielding 55 per cent gasoline, 20 per cent heavy fuel oil, and 25 per cent distillates. Eagle Point will represent the first commercial application of Texaco's process for using furfural to eliminate sulphur in crude oil in the production of such petroleum products as heating oils. Furfural has hitherto been used principally in the refining of motor oils.

* * *

Mr. John R. Steelman, President Truman's White House assistant, reports that the U.S. Government is sponsoring a vastly increased programme of scientific research. "Only 20 years ago," he says, "the total private and Governmental expenditures for research were about $166 million. By 1940 the the amount spent was $345 million, and today the Federal expenditures alone are nearly $1400 million." Mr. Steelman said that the nation must offer every incentive to science and experimentation, and called for the establishment of a national science foundation.

* * *

The Otto H. York Company, Inc., East Orange, New Jersey, has been granted merchandising and manufacturing rights in the U.S.A. for the mechanical seals of Flexibox, Ltd., Manchester, England. These seals, originally designed to overcome problems encountered during the operation of oil refinery process pumps, have proved so effective, that a demand was created for their adaptation to other industrial processes.

* * *

Mr. M. Novomeysky, managing director of Palestine Potash, Ltd., is at present in New York on a mission to raise $8-$9 million from British and American companies to aid in the development of potash deposits around the Dead Sea. The company hopes to get most of the capital from the U.S.A. as investment by private companies. The Dead Sea is said to contain, in addition to potash, large quantities of magnesium chloride.

* * *

A new acrylic fibre said to be resistant to sunlight effects is the latest addition to the range of synthetic textile filaments. The fibre has been produced in the research department of the Chemstrand Corporation which was recently formed by the Monsanto Chemical Co., and the American Viscose Corporation, and it is expected that it will be available for commercial testing in the next few months.

* * *

Described as "a significant contribution to radiological defence," the development is announced by United States Army officials of a new, compact, lightweight, radiation-detecting device, called a "radiac set," primarily for use by military and civil defence organisations. The new device, first of its kind developed for heavy field use, employs an ionisation chamber and makes use of results of atomic bomb tests in the Pacific. Less sensitive than the Geiger counter, the radiac set is intended for detection and measurement of relatively large concentrations of radiation beyond the normal capabilities of the Geigy counter. It is 10½-in. long and weighs 10 lb.

* * *

A new patent covering cobalt solution purification has been made available for non-exclusive and royalty-free licensing by the U.S. Department of the Interior, Washington, D.C. Impure cobalt solution, in which zinc is present, is treated with an excess of hydrogen sulphide under an elevated pressure of at least 10 p.s.i., and at a solution pH between 1 and 6. Zinc is precipitated as a sulphide, and the purified cobalt solution drained off.

Agents for Lithium Minerals

"Alreco" (The Almex Recovery and Refining Co., Ltd.), Adelphi Terrace House, Robert Street, London, W.C.2, has been appointed sole sales representative for Europe and the British Commonwealth of the Black Hills Keystone Corporation of South Dakota, U.S.A., producers of lithium-bearing minerals, such as amblygonite and spodumene.

OVERSEAS

Spitsbergen's Record Coal Shipments

Shipments of coal from Spitsbergen by the Spitsbergen Coal Company were 403,000 tons this year, the largest ever recorded. Last year's total was 350,000 tons.

New Temperature-Resistant Steel

The Lebanon steel foundry in Pennsylvania on November 28 announced that it had developed a super-alloy cast steel which would stand great extremes of heat or temperatures as low as 423°F. below zero. This "Lebanon-22" contains, among other constituents, 19.50 per cent chromium and 9 per cent nickel. The firm says the alloy has already been used effectively in the production of steel castings for storage of liquid oxygen.

Rubber Consumption and Stocks

World consumption of natural rubber for the first nine months of 1949 was 1.19 million tons, including Russian imports estimated at 97,500 tons, states the Rubber Study Group. Aggregate production for the same period was 1.2 million tons. The rise in the world consumption was continued in October, when the 127,500 tons was 12,500 tons above the September figure. Stocks of natural rubber at October 30 amounted to 725,000 tons, showing a decline of 45,000 tons since January 10. Synthetic rubber stocks were 120,000 tons, a fall of 5000 tons since January 1.

Cobalt Smelting in Canada

The Cobalt Chemical and Refinery Company, Ltd., as part of its expansion programme, has put into operation its new cobalt smelter at Cobalt, Ontario(THE CHEMICAL AGE, *61*, 394). The smelter will be concerned chiefly with the production of chemical derivatives of cobalt. When completed, the plant will have cost about $1.25 million. Full-scale operations should begin in March. Electro-furnaces have made the first run of bullion and speiss produced from local ores. A wide range of industrial and agricultural chemical derivatives will eventually be produced. Cobalt has recently assumed great importance because of its heat-resistant qualities which make it indispensable for use in rockets, jet propulsion power plants and similar exacting rôles. The new supply may replace some imported materials.

Duty-Free Books and Films

A draft of an international agreement to facilitate the circulation of educational matter of many types has been sent by Unesco to all the member states of UNO. The agreement was drafted by the conference at Annecy, France, in which 34 nations took part, and seeks duty-free entry for educational material.

U.S. Firm Regains German Plants

The American Radiator and Standard Sanitary Corporation, New York, has repossessed the Neuss plant properties of its German subsidiary, Nationale Radiator Gesellschaft GmbH. The plants are a pottery, an enamelled iron plant and a radiator plant, all located in Neuss in the Western zone of Germany. They had been under the custodianship of the Allied Military Government.

British Science Lectures in U.S.A.

"The Growing Importance of Infra-Red Studies in Physics, Chemistry and Biology," will be the subject of the British-American Association lecture to be given by PROF. G. B. B. M. SUTHERLAND at the meeting of the American Association for the Advancement of Science to be held in New York from December 26-31. The professor, formerly of Cambridge, is now professor of physics in the University of Michigan. A talk on the organisation of science in Britain will be given by DR. W. A. MACFARLANE, of the United Kingdom Scientific Mission in Washington.

Steel for Canada

British steel firms are expecting orders worth between $15 and $20 million from Canada during the next 12 months. Their representatives have been concentrating on the sale of particular products, while a team led by Sir George Binney has made a coast-to-coast survey of the Canadian market during the past seven weeks. Mr. Edward Senior, commercial director of the British Iron and Steel Federation, joined the mission in the final stages of the negotiations.

About half the tonnage has already been definitely booked, including a valuable rail order for British Columbia. Steel plates, bars and tubes are the other principal products to be exported, but orders for a wide range of British steels were secured.

Next Week's Events

MONDAY, DECEMBER 12

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. (With RIC and SCI). Prof. H. J. Emeléus: "Some Recent Advances in the Chemistry of Fluorine Compounds."

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. C. E. Webb: "Sulphur Chloride Reactions in Relation to the Rubber Industry."

Institute of Metals

Glasgow: 39 Elmbank Crescent, 6.30 p.m. Discussion: "The Casting of Non-Ferrous Metals."

Society of Chemical Industry

Leeds: University, 7 p.m. W. R. Atkin: "The Durability of Leather."

TUESDAY, DECEMBER 13

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Dr. A. G. Evans (University of Manchester): "Polymerisation by Friedel-Crafts Catalysts."

The Royal Institute of Chemistry

Mitcham Junction: Philips Electrical, Ltd., New Road, 6.45 p.m. H. A. Klasens: "Chemistry of Bioluminescence and its Importance in Animal Behaviour."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. J. M. Coulson: "Fluid Flow through Granular Beds."

Institute of Physics

London: 47 Belgrave Square, W.1, 5.30 p.m. (Electronics Group). Dr. W. Grey Walter: "The Nervous System as an Electrical Machine."

Society for Visiting Scientists

London: 5 Old Burlington Street, W.1, 7.30 p.m. Discussion: "The Scientific Approach to Human Problems in Industry." Chairman: General Sir Ronald Adam. Speakers: Sir George Schuster, and W. B. D. Brown.

Society of Instrument Technology

Manchester. Reynolds Hall, College of Technology, 7.30 p.m. Dr. G. Jessop: "Gas Analysis by Katharometer."

WEDNESDAY, DECEMBER 14

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.15 p.m. (Food Group, Nutrition Panel). "The Nation's Manufactured Foods," third meeting of series.

Scottish Engineering Students' Association

Glasgow: 39 Elmbank Crescent, 7.30 p.m. J. C. Murray: "Marine and Industrial Gas Turbines."

Irish Chemical Association

Dublin: Trinity College, 7.45 p.m. T. F. O'Reilly: "Some Aspects of Water Chlorination."

British Association of Chemists

London: Falstaff Restaurant, Eastcheap, 7 p.m. Smoking concert. Running buffet.

THURSDAY, DECEMBER 15

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.15 p.m. D. Ll. Hammick and S. F. Mason: "Some Physico-chemical Properties of Acridine Antimalarials with reference to their Biological Action"; C. C. Addison and S. K. Hutchinson: "The Properties of Freshly Formed Surfaces." Parts 11-14.

Liverpool: University, 4.30 p.m. Dr. W. Charles Evans: "The Biological Oxidation of certain Aromatic Compounds with special reference to the Bacterial Cleavage of the Benzene Ring."

The Royal Society

London: Burlington House, Piccadilly. W.1, 4.30 p.m. The Wilkins lecture. Prof. E. N. da C. Andrade: "Robert Hooke."

Oil and Colour Chemists' Association

Glasgow: St. Enoch Hotel, 7 p.m. R. Wilson: "Improved Film-forming Materials from Dehydrated Castor Oil."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. E. Davis: "Recent Progress in Copper and Copper Alloys."

FRIDAY, DECEMBER 16

Oil and Colour Chemists' Association

Birmingham. Chamber of Commerce, New Street, 6.30 p.m. A. W. Wolstenholme: "Silicone Resins in Paint Manufacture."

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. F. F. Heyman: "The Betatron."

Atomic Scientists' Association

London: University College, Gower Place, W.C.1, 6 p.m. Prof. J. S. Mitchell (Cambridge): "Medical Advances in Nuclear Physics."

Electrodepositors' Technical Society

Sheffield: Grand Hotel. A. E. Nicol: "The Mechanism of Electrolysis."

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

East Anglia Chemical Co., Ltd., Darlington. (M., 10/12/49.) November 9, debenture, to Martins Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£21,400. December 31, 1948.

Electronic Developments (Surrey), Ltd., Surbiton. (M., 10/12/49.) November 4, £2500 debenture, to Branch Nominees, Ltd.; general charge. *£2500. October 5, 1949.

Lautaro Nitrate Co., Ltd., London, E.C. (M., 1012/49.) October 27, two mortgages, each supplemental to a trust deed dated October 22, 1925, deeds dated December 15, 1936, supplemental thereto, indenture securing series of bonds dated July 1, 1929, and deeds supplemental thereto; both charged on certain areas of land in Chile. *£2,645,767. January 12, 1949.

National Fire Protection Co., Ltd., London, E.C. (M., 10/12/49.) November 10, £4600 mortgage, to Sterling Securities Investment Co., Ltd.; charged on Castlehurst, Station Road, Leatherhead, together with certain rights. *£66,638. January 5, 1949.

Increases of Capital

The following increases in capital have been announced, Brownings & Goldsbrough, Ltd., from £5000 to £7000; Robert Young & Co., Ltd., from £50,000 to £100,000.

Change of Address

The head office (including the registration department) of the British Oxygen Co., Ltd., is now at Bridgewater House, Cleveland Row, St. James's, London, S.W.1. (Telephone No. WHItehall 9777).

Company News

Evans Medical Supplies

Stockholders of Evans Medical Supplies, Ltd., at special class and extraordinary general meetings of the company, in Liverpool on December 1, approved proposals covering several changes in the capital of the company, one of which will increase the authorised capital from £450,000 to £1 million (The Chemical Age, *61*, 718).

Industrial and Commercial Finance Corporation, Ltd.

The statement by the chairman, Lord Piercy, to be presented at the fourth annual general meeting, on December 20, of Industrial and Commercial Finance Corporation, Ltd., indicates an operating profit for the twelve months to September 30 of £149,394. An analysis of industries which the corporation has been able to assist, with the total of business approved in each case, includes: cement and lime £260,000; chemicals £1,553,400; non-ferrous metals £281,000; rubber manufacture £170,000; plastics £362,000; scientific instruments £105,000.

Lawes Chemical Co., Ltd.

Dividends of 7 per cent on the non-cumulative participating preference shares and 6 per cent on the ordinary shares (both net) are announced. Referring to the Government decision to remove fertiliser subsidies in two stages (July 1, 1950, and July 1, 1951), the chairman foresaw that resulting increased prices might have an adverse effect on demand. It was hoped to complete erection of the company's sulphuric acid plant for operation in a year's time.

Richard Thomas and Baldwins, Ltd.

An interim dividend of 5 per cent, less tax, on the ordinary stock for the year ending April 1, 1950, payable on February 1, has again been declared by the directors. A similar interim payment was paid for each of the three previous years, followed by 10 per cent final dividends. A dividend of 3½ per cent in respect of participating rights on the preference stock, as a year ago, is also announced.

Watson, Laidlaw and Co.

A share issue of 110,000 shares at 12s. 6d. is being arranged by Glasgow Industrial Finance, Ltd., in the old established Glasgow concern of Watson, Laidlaw & Co., Ltd., centrifugal engineers and specialists in sugar, chemical, laundry and textile plant manufacturing.

The Stock and Chemical Markets

A DULL phase and irregular trends in stock markets are evident. British Funds eased because of doubts that the Government broker will still be prepared to support the gilt-edged market now that conversion terms for 1¾ per cent Exchequer bonds have been announced. The new 2¼ per cent Exchequer bonds are generally expected to command a price of at least par when dealings start. Industrial shares were inclined to ease, but generally the volume of business has been small.

Chemical and allied shares again moved closely with the general market trend. Imperial Chemical, for instance, touched 43s., but later eased to 42s. 6d. Dunlop Rubber were 61s. 6d. after being 62s., and Turner & Newall 75s. 6d. after 76s. 3d. Monsanto kept steady at 50s., Albright & Wilson were 30s., and Amber Chemical 2s. shares 4s. 7½d. Fisons changed hands around 28s., and there are reports that this company may raise further capital, possibly in the form of private placing of debentures. Brotherton 10s. shares have been around 19s. 3d., Laporte Chemicals 5s. ordinary units were 9s. 6d., and Glaxo Laboratories were good, changing hands at up to £22. Howards & Sons new 5½ per cent preference were about 22s. 9d.

British Xylonite came back to 60s. after touching 61s. 3d.; British Industrial Plastics 2s. shares were 4s. 10½d.; Kleemann 8s. and De La Rue better at 23s., although shares of plastics and allied companies generally were uncertain. The 4s. units of the Distillers Co. improved to 18s. United Molasses were 39s. 3d., but British Match firmed up to 32s., and British Oxygen, at 90s. 3d., and British Aluminium, at 41s. 6d., have been firm. Levers attracted attention up to 43s. 9d., and Lever N.V. improved to 44s. 3d. Elsewhere, General Refractories improved to 22s. 4½d. and Triplex Glass to 17s. 7½d. Firmness was maintained by Borax Consolidated at 57s. 9d., and British Glues were better at 18s. 6d. Amalgamated Metal at 18s. failed to hold an earlier gain.

Iron and steels moved narrowly, but have been generally quite well maintained. Babcock & Wilcox strengthened to 60s. 3d. and T. W. Ward showed firmness at 55s. 1½d. Staveley firmed up to 80s., although Wm. Cory came back to 79s. 6d. Powell Duffryn were better at 26s. 6d. Pinchin Johnson came back to 34s. 6d. for the big new issue which will bring in over £1 million for factories at home and the company's overseas subsidiaries.

Boots Drug were better at 49s. 9d., but Beechams deferred eased to 14s. 10½d. after an earlier rise. German Potash Bonds improved, the 7 per cent to 68½ and the 6½ per cent to 64½.

Market Reports

A STEADY trade characterises most sections of the industrial chemicals market and quotations remain unchanged although with a very firm undertone. A fair amount of contract renewal business has already been placed and inquiries for new business covering deliveries during the first half of 1950 are fairly numerous. The volume of inquiry for shipment shows no sign of falling off and export trade is facilitated by the better supply position. Both the potash and soda compounds continue at the recent level of prices, and similar conditions apply in other directions with the exception of borax and boric acid prices, which were reduced on December 1 to £35 10s. per ton and £63 10s. per ton respectively. As from December 1 the maximum prices for ground sulphur were increased to 33s. per ton, the increase being due to the change in the sterling-dollar exchange rate. In the coal tar products market there is a keen demand for pitch, both on home and export account. There is a very active demand for xylol and a steady interest is maintained for carbolic acid, cresylic acid and toluol.

MANCHESTER.—The usual seasonal slackening in new business is likely to be witnessed in the next week or two, although this is not yet in evidence. During the past week there has been a fair amount of new inquiry from home consumers as well as from shippers. Delivery instructions against contracts for caustic soda, potash, ammonia and magnesia chemicals have been circulating steadily. A fair demand is reported for most of the tar products, particularly the light distillates. Export business in basic slag and a few other sections of the fertiliser trade has been moderate.

GLASGOW.—Business in the Scottish chemical market has shown a decided improvement. Prices have tended to be firm, although no marked advances have been noted. Export market conditions generally have been quiet.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Heating of containers receiving material intended to be extruded under pressure.—Soc. Anon. des Ateliers et Chantiers de la Loire, and Compagnie Generale du Duralumin et du Cuivre. Jan. 5 1944. 630,468.

Anti-fouling paints and like compositions.—E. L. Holmes. Sept. 25 1947. 630,534.

Dielectric heating apparatus.—Westinghouse Electric International Co. Oct. 4 1946. 630,355.

Manufacture of organic pigments and moulding powders.—Calico Printers' Association, Ltd., L. A. Lanze, A. Schofield, and E. Spinner. Oct. 8 1947. 630,359.

Clamping means for apparatus for use in scientific demonstrations.—W. & J. George & Becker, and R. H. Morris. Oct. 23 1947. 630,409.

Treatment of clay.—English Clays Lovering Pochin & Co., Ltd., N. O. Clark, and T. W. Parker. Nov. 11 1947. 630,418.

Electronic treatment of liquids for the purpose of reducing the effects of hardness.—A. H. Brake, and S. C. Osborne. Nov. 12 1947. 630,419.

Flow meters.—R. P. Black. Nov. 26 1947. 630,473.

Rotary pumps for liquified gases.—Linde Air Products Co. Jan. 9 1947. 630,483.

Rotary pumps for liquified gases.—Linde Air Products Co. Jan. 9 1947. 630,542.

Process for the production of rubber-like copolymers.—J. C. Arnold. (Standard Oil Development Co.). May 29 1945. 630,362.

Production of fluorocarbons, and fluorohydro-carbons.—W. N. Haworth, F. Smith, and E. V. Appleton. June 23 1944. 630,606.

Process for the production of amino alkyl thiazole derivatives.—Ward Blenkinsop & Co., Ltd., A. A. Goldberg, and W. Kelly. July 11 1945. 630,671.

Method and device for combusting waste liquors with recovery of chemicals.—D. Dalin. June 20 1945. 630,857.

Hydrogenation of cyclic organic nitrogen compounds.—I.C.I., Ltd., J. G. M. Bremner, and F. Starkey. July 5 1946. 630,859.

Process for the preparation of nuclear substituted quinoline compounds and intermediates therefore.—H. R. Snyder, and R. E. Jones. June 4 1945. 630,860.

Manufacture of substituted ammonium thiocyanates.—Koppers Co., Inc. July 11 1945. 630,861.

Hydrogenation of cyclic organic compounds.—I.C.I., Ltd., J. G. M. Bremner, and F. Starkey. July 17 1946. 630,863.

Acylated esters of hydroxy-substituted 18 carbon atom aliphatic monocarboxylic acids and process of preparing same—B. F. Goodrich Co. Aug. 10 1945. 630,610.

Alkaline washing agents.—Soc. des Produits Peroxydes. Jan. 15 1942. 630,864.

Processes for producing hydrogenated tall oil acids and the product resulting therefrom.—A. H. Stevens. (Armour & Co.). Aug. 22 1946. 630,686.

Method of fusing materials such as glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny & Cirey. Jan. 29 1945. 630,735.

Methods of polymerising unsaturated monomeric organic materials.—B. F. Goodrich Co. May 3 1944. 630,611.

Sensitised sheets for positive diazotype screen reflectography processes.—Chemische Fabriek L. Van Der Grinten. Nov. 1 1945. 630,874.

Synthetic resin compositions.—Continental Can Co., Inc. Oct. 11 1941. 630,700.

Silicone compositions.—British Thomson-Houston Co., Ltd. Nov. 30 1945. 630,883.

Absorption and separation of vapours and gases.—I.C.I., Ltd., W. Tyerman, and F. Wrigley. Dec. 4 1946. 630,884.

Manufacture of activated carbon.—T. Ness, Ltd., O. Reynard, and W. A. Walmsley. Dec. 5 1946. 630,886.

Process for the manufacture of fluoranthene derivatives.—Ciba, Ltd. Dec. 21 1945. 630,704.

Melamine resins.—British Industrial Plastics, Ltd. June 7 1946. 630,618.

Method of obtaining refined aluminium, starting from aluminium alloy scrap.—Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges & Camargue. Dec. 3 1945. 630,891.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21 1946. 630,892.

Apparatus for dispensing liquefied gases.—Linde Air Products Co. Jan. 23 1946. 630,893.

Apparatus for testing porous masses charged with acetylene.—J. S. Skelton, and C. M. Smith. Jan. 18 1947. 630,895.

Process for preparing 2-sulphanilamidopyrazine and the 2-sulphanilamidopyrazine resulting therefrom.—Mead, Johnson & Co. Feb. 5 1941. 630,898.

Production of aldol and/or crotonaldehyde.—Usines de Melle. Feb. 18 1946. 630,904.

Linear polythioesters.—Wingfoot Corporation. Nov. 2 1946. 630,625.

Production of nitric oxide.—Wisconsin Alumni Research Foundation. Aug. 16 1943. 630,175.

Liquid compositions.—British Thomson-Houston Co., Ltd. March 21 1946. 630,911.

Process of obtaining barium carbonate.—G. & W. H. Corson, Inc. April 30 1946. 630,720.

Hydrolysis of vinyl ethers.—General Aniline & Film Corporation. June 28 1946. 630,926.

Alkylene cyanohydrins and method of producing same.—American Cyanamid Co. June 4 1946. 630,929.

Polymerisable compositions and polymers thereof.—E. I. Du Pont de Nemours & Co. May 21 1946. 630,632.

Resolution of azeotropic mixtures of chlorosilanes.—British Thomson-Houston Co., Ltd. May 23 1946. 630,724.

Conjugation of fatty oils and acids.—Lever Bros. & Unilever, Ltd., and D. McNicoll. June 6 1947. 630,634.

Preparation of tetramethyl silicate.—British Thomson-Houston Co., Ltd. June 26 1946. 630,644.

Method of adhesively uniting materials, especially metals, and adhesives therefor.—Ciba, Ltd. July 19 1946. 630,647.

Manufacture of esters of cellulose.—British Celanese, Ltd. July 17 1946. 630,937.

Process for the manufacture of folic acid.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). July 18 1947. 630,751.

Parasiticidal preparations. — United States Rubber Co. Oct. 14 1938. 630,752.

Ferrous alloy.—Coast Metals, Inc. Aug. 3 1940. 630,753.

Phenol-acetal reaction products.—Harvel Corporation. June 29 1943. 630,758.

Hydrocarbon synthesis process.—Standard Oil Development Co. Nov. 9 1946. 630,950.

Manufacture of organo-silicon esters.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 630,951.

Manufacture of organo-silicon alcohols.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947 630,952.

Extrusion machines for materials in a plastic state.—C. L. Willis. Oct. 3 1947. 630,662.

Method of adhesively uniting materials and adhesive agents therefor.—Ciba, Ltd. Oct. 25 1946. 630,663.

Silvering of non metallic heat-resisting bases.—Johnson, Matthey & Co., Ltd., and F. E. Kerridge. Dec. 11 1947. 630,780.

Method of obtaining antimony from sulphurised antimony ores.—Soc. Minière et Metallurgique de Penarroya, and J. J. Listrat. Oct. 30 1946. 630,782.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order*

MANUFACTURING Chemists in London require for research work a **QUALIFIED CHEMIST** with specialised knowledge of the soap and perfumery trade. Commencing salary £1,200 per annum, plus share of profits. Applications, giving complete details regarding age, qualifications, experience and previous positions held, should be sent to **Box No. 2875, The Chemical Age, Fleet Street, London, E.C.4.**

MINISTRY OF SUPPLY invites applications from **CHEMICAL ENGINEERS** for post at a Research and Development Establishment near London, to lead section engaged on basic design of plant for experimental manufacture of explosives and intermediates, and to obtain data for full scale design.

Candidates must have good honours degree or equivalent in chemical or mechanical engineering or chemistry with post graduate training in chemical engineering. Experience in modern engineering practice and above type of work essential.

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Application forms obtainable from Technical and Scientific Register (K), York House, Kingsway, London, W.C.2, quoting F.852/49/BZ (closing date—7th January, 1950.) 21. 11A42 (30).

SITUATIONS VACANT

MINISTRY OF SUPPLY invites applications from **PHYSICAL** or **INORGANIC CHEMISTS** for appointments at a Research Establishment in the London area.

Candidates should have a good honours degree or equivalent with post graduate experience an advantage. Some posts require a good knowledge of spectroscopy, radiation chemistry or modern physico-chemical methods of analysis.

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Application forms available from Technical and Scientific Register (K), York House, Kingsway, London, W.C.2, quoting F. 697/49/BZ. Closing date 3rd January, 1950. 17. 11A24 (30).

SENIOR WORKS EXECUTIVE required for large firm of organic chemical manufacturers to take complete charge of production. Applications are invited only from fully qualified and experienced men aged not less than 40 who have already been in charge of large-scale production and administration of over 2,000 persons. Post is permanent and pensionable and only men of first-class ability and experience will be considered. Please address applications to **BM/ULA London, W.C.1.**

WORKS ENGINEER required to take charge of Engineering and Maintenance Department of medium-sized **Tar Distillation and Chemical Works** in N.E. England. Only those with sound all-round practical training and experience in control of labour need apply. A.M.I.Mech.E. or equivalent an advantage. It would also be considered an advantage if the applicant has experience in operation and maintenance of modern steam-raising plant. Age not more than 40 years. Superannuation scheme. Write, giving full particulars of age, experience and salary required, to **Works Manager, Box No. 2869, The Chemical Age, 154, Fleet Street, London, E.C.4.**

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The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Atomic Energy Prospects

SPECULATIONS by the few who are competent to offer realistic views on the subject of atomic energy are with few exceptions surprisingly in agreement on one point. In no country will the vast gift of abundant energy which atomic piles could yield to industry and human amenity in general come within reach in the near future. Time estimates vary, but not the intention, which sensibly aims to discourage premature planning based on an uncertain quantity. Yet, so profound—and fascinating—are the prospects, it would be less than human deliberately to exclude a tentative estimate of what may be the effects in industry, and especially in chemical industry, when nuclear physicists, chemists and chemical engineers finally overcome the formidable difficulties of canalising the greatest flow of artificial heat to be generated. It is hoped that a useful light will be cast on these possibilities at the fourth World Power Conference in London next July.

An interesting introduction has meanwhile been offered by Professor Robert S. Aries (Brooklyn Polytechnic, New York) in a review for French chemists* of what may be the results in some of their own industries. Professor Aries does not fully support the remote view; he thinks the practical uses on a large scale of the atomic source of power may be much nearer than is generally anticipated.

It is generally agreed that atomic energy will be commercialised in the first place in the form of electric power; and it would thus interest primarily those electro-chemical branches of industry already mainly dependent on electric power. They would need to make no radical change in plant and equipment. In other branches of chemical industry using other sources of power careful study would have to be given to the changes in plant organisation and cost.

The use of the new source of energy would undoubtedly be regulated largely by the factors of cost, its special properties and adaptability. Little precise information is available regarding two of these, but Professor Aries believes that the unit cost would be approximately the equivalent of 1 cent per kWh. That is about the same as the present power cost in some electro-chemical industries. But, says Professor Aries, happily only the initial installations would need that tariff level: later ones could in all probability reduce power charges to 0.4 or

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* Chim et Ind. 1949, Nov., 62, 497-502.

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0.5 cent. It has to be remembered that the cost of coal and oil is likely to rise continually and resources are not getting larger. The great cost factor in atomic power is the fixed or capital costs; running costs or consumption of material—uranium or thorium—are negligible. In that, an atomic energy plant resembles a hydro-electric, rather than a thermal, power station.

Much of the power used in chemical industry is concentrated in the electro-chemical and electro-metallurgical branches; power costs in the heavy chemicals branch, excepting caustic soda and chlorine, are relatively low. The manufacture of sulphuric or hydrochloric acid, for example, requires no more than 35-36 kWh per ton produced. For ammonia synthesis, on the other hand, coal costs may represent at least half the cost price.

The installation costs of a hydro-electric plant may reach colossal figures, and require 50 years to pay off capital charges. Few private concerns can indulge in such long-term budgeting. In France, as elsewhere, it is an obvious condition that atomic power plants should be installed in large manufacturing centres, present or potential. If power were available, such centres could be created jointly with the appropriate generating station. The use of large blocks of power, directly rather than indirectly, should be the objective. In the manufacture of fertilisers such as superphosphates, the present wet method with sulphuric acid could be immediately replaced by an electric furnace process with large power expenditure per ton, in the neighbourhood of 13,000 kWh. There is little doubt that chemical engineers will find many other similar examples. While hydro-electric power stations are very limited as to site and proximity to consumers and coal costs increase rapidly with transport and other charges, atomic power is subject to none of these limitations.

Professor Aries finally exhibits a prospect which will apply equally to any country which develops the atomic source of energy. French chemical industry would doubtless undergo radical changes in distribution and organisation. The steel works of Alsace and Lorraine would be able to treat ore locally available with atomic energy supplied on the spot. This could also replace coke required in blast furnaces or supply electric power for smelting and rolling. The possibilities in many directions are obviously vast and revolutionary, reaching out beyond the confines, extensive as these are, of chemical industry alone.

Notes and Comments

Chemists Needed

IF demand for their services can be taken as a reliable criterion, prospects for most chemistry graduates are excellent, and are likely to remain so for some years to come. The authority for that view, which in general underlines the evidence which has come from many other directions since the war, is one of the Ministry of Labour surveys issued last week, giving for the first time, a factual account of the relationship between national needs of technicians and scientists and the number and quality of those coming from the enlarged educational centres. While the Ministry's tentative approach to the possible future numbering and allocation to industries of scientists of various sorts has roused little enthusiasm among those most intimately concerned, judging by the common attitude towards the Technical and Scientific Register, the five reports now rendered, including those on Chemistry and Physics, are in a different category. They present the views of practical and expert people including leading practitioners of the professions concerned, and representatives of the universities and profesional institutions, as well as of the Government departments—and, it is assured, they have had an entirely free hand in collecting and interpreting the evidence of what industry and the research departments must have in the next five to ten years.

Numbers Doubled

THE vitality of present-day chemistry gains a further testimony in the report of the specialist sub-committee, recording that, although chemistry has succeeded in doing what the Barlow Committee urgently recommended in 1946 for all the sciences, in doubling its number of qualified people, " saturation point " is very far from being reached. The demand at the present high level is likely to continue for many years, this committee forecasts. The report does more than record the facts. It is eminently constructive and is not limited by whatever has been considered acceptably orthodox in the past. That is evidenced by the committee's observations on the new intake, and on other things. Of tomorrow's chemists it asserts: " Too many young men undertaking post-graduate training are encouraged to regard research in pure science as the only worth-while carer for a chemist. In consequence, such men enter industry with a wrong attitude of mind and as a result have little interest or enthusiasm for the practical application of science. Industry's requirements on the production side will never be wholly and satisfactorily filled with the chemist of second rate ability. We suggest that the university departments of chemistry should endeavour to assess individual capabilities and personalities to ensure that both research and process needs are met adequately and appropriately."

Neglected Thermodynamics

THE decision of the Council of the Senate of Cambridge University to create, next October, a professorship of applied thermodynamics affords encouraging evidence of the growing readiness of the universities to recognise the urgency of some current needs of the moment to which little or no attention has been paid in the past. The comparatively recent admission of chemical engineering as a sufficiently well defined science to merit a university chair seems to have indicated a profound change of outlook, of which the decision to teach thermodynamics at Cambridge is the most convincing example. The mathematical treatment of the relation of heat to mechanical and other forms of energy has understandably held the rôle of Cinderella among the sciences, perhaps because it requires of its practitioners a mathematical attainment on a par with the physicist's and offers even tardier satisfactions to those looking for practical applications of theory. Yet, an enterprising employment of thermodynamics is most evidently fundamental to continuous increase in efficiency of a host of industries, while atomic power projects will probably render this branch of science even more indispensable. All the newer forms of propulsion are more or less closely dependent upon the relationship between heat and energy. Cambridge University authorities will be congratulated in this connection for having had an ear to the ground (and an observant eye on the future), and as the recipients of the Imperial Chemical Industries' offer of £50,000 during the next seven years to support the new Hopkinson and Imperial Chemical Industries Professorship of Applied Thermodynamics. The two gifts supporting this research and teaching undertaking commemorate Bertram Hopkinson, engineering professor at King's College, London, who was killed in the 1914-18 war, and also I.C.I's expert estimation of the route by which some of the next industrial advances should come.

Tackling Water Pollution

THE possibility that there would be substantial changes in the legislation intended to keep within bounds the pollution of inland waterways and perhaps some tidal waters is not a new one. Chemical industries, which in most instances have willingly undertaken the expensive task of rendering their trade effluents harmless, are unlikely to take alarm at the proposals of the expert sub-committee, issued this week (page 835, this issue) of which the passing of a new Act of Parliament to replace the increasingly ineffectual Rivers Pollution Prevention Act of 1876 is the keynote. It is reassuring to know that, in its plans to empower the future River Boards to procure some degree of uniformity in deciding what is a reasonable tolerance, the investigating committee has had a keen appreciation of what is practicable and what constitute the worst sources of river pollution. Regardless of stories of streams having been converted into "chemical drains," the latest recommendations do not disguise the identity of the principal culprits, the sewage disposal plants, whose capacity has now to be very greatly increased and whose efficiency, impaired by lack of men and materials during the war, is not adequate even for present requirements. The aims are now to make the sewage disposal departments accept a greater responsibility for the disposal of trade wastes, which in many cases will call for drastic enlargement of existing capacity, and to limit the privilege of some private firms of discharging any amount of effluents, treated by "the best practicable means reasonably available" through any outfall which was in use when the 1875 Act was framed. "Reasonably available" is the qualification which, it is safe to predict, will determine all future work towards securing even a moderate improvement in the state of water courses in the industrial regions.

The 1950 Year Book

THE CHEMICAL AGE YEAR BOOK for 1950, which "C.A." subscribers have received this week, is one of the small class of technical literature which does not add to the embarrassment felt by those who are called upon to digest a spate of specialised publications in their leisure moments. The 1950 Year Book brings together the type of classified information—about sources of plant, materials and services, technical, legal and commercial affairs, organisations, officials and current literature for chemists—which has not all to be absorbed at short notice and the need for which continues throughout the year. Among new features, the review of recent literature concerned principally with the analysis of inorganic substances has a value which will ensure its preservation long after the information afforded by some other sections has been superseded by the 1951 Year Book. It is, of course, not the only contribution whose usefulness will not end when the year has run its course. The considerably enlarged Buyers' Guide remains one of the most informative directories available to those needing to find quickly the principal sources of plant, instruments and chemicals.

NEW CHEMICAL CENTRE

A Lead by Durham University

THE new chemistry department at King's College (Durham University), Newcastle-upon-Tyne, was officially opened on December 10 by Sir Robert Robinson, president of the Royal Society. The five-storey building, which houses the new department, is already in use. There are three lecture theatres, the largest of which seats 300, five teaching laboratories and a number of research sections.

Only the Prelude

Sir Robert Robinson observed that chemistry occupied a central position between the sciences and had relations through physics with mathematics and through bio-chemistry with the fundamental biological sciences and medicine. It was accordingly of great importance that one of the first buildings to be erected under the King's College extension scheme should be a chemical block.

It was a mistake, said Sir Robert, to regard chemistry as a highly developed science. No part of chemistry had yet been completely worked out. "In fact, I doubt if we know much about the subject at all," he added. A great deal more research work was needed.

Until recently nobody had suspected that two common substances, such as methyl alcohol and urea, could be transformed into a solid. Sir Robert carried out an experiment to prove that it could. "Do you know," he said, "there is a great deal of money in this sort of thing."

Lord Ridley presided at the ceremony which was attended by distinguished chemists from other institutions.

November's Steel Record

PRODUCTION of steel ingots and castings in November was at an annual rate of 16.358 million tons, compared with 15.959 million tons the previous month, and 15.76 million tons in November 1948.

This was only slightly lower than the peak figure established in May, when the annual rate was 16.409 million tons.

The target set for the industry for the year in the Economic Survey was 15.25 to 15.5 million tons, and during the first three-quarters of the year an annual rate was achieved of 15.449 million tons.

Output of pig iron also showed an increase, to an annual rate of 9.745 million tons a year ago, and 9.565 million tons in October this year.

PETROLEUM & TIN IMPORTS

Chancellor on Balance of Trade

THE new chemistry department at may, before long, need to restrict dollar imports further was called to mind by some observations by the Chancellor of the Exchequer (Sir Stafford Cripps) at a Press conference in London last week.

Petroleum and tin were singled out as large contributors to the unbalance between United Kingdom and overseas trading accounts. Even "sterling oil," the Chancellor said, had in it a considerable element of dollar cost, and economies throughout the sterling area were therefore essential unless we were to go without more essential foodstuffs or raw materials.

£50 Million a Year

Tin from Bolivia was one of the major items, accounting for an expenditure during the past 12 months of about £50 million on imports from the American account countries. British oil companies incurred very heavy operating expenses in dollars in Venezuela, and to a lesser extent in Colombia, whereas, as markets for our exports, most of these countries were comparatively small and difficult.

American account countries (largely South American) were, however, together an important source of U.K. dollar earnings; during the past year exports to them had totalled £25-£30 million, to which chemicals had contributed £1 million.

In Venezuela the most important possibilities existed for increasing U.K. exports. An unrestricted, expanding and relatively accessible market, it was virtually untapped so far by U.K. exporters, said the Chancellor. Yet, of current U.K. exports to Venezuela over half the total was made up of equipment for British oil companies for which there was no direct dollar return.

Of other countries to which we paid gold or dollars, Persia was by far the most important. Owing to our great interest in Persian oil we had to pay out dollars to cover that country's essential purposes in the dollar area. Tyres and tubes, rayon, pharmaceuticals and electrical goods were among Persia's more important imports from the dollar area, but she would be willing to purchase such goods from sterling countries, provided they were competitive in price and time of delivery.

CEYLON'S COCONUT OIL

New U.K. Contract Talks Fail

THE talks between the U.K. and Ceylon (THE CHEMICAL AGE, *61*, 781) regarding a contract for copra and coconut oil for 1950 are reported to have failed, no agreement having been reached either with regard to a long-term contract or the price for 1950. The export control of coconut products is thus likely to continue —writes our Colombo correspondent.

The hitch arose over the price of Rs.250 for a candy of copra, which Ceylon is said to have demanded. The British delegation was prepared to offer £5 less than the present contract price of £55 per ton for only one year; the Ceylon officials wanted a three-year contract. This brought the discussion to an abrupt end. The British delegation cabled home for instructions on this point, but apparently H.M. Government was not prepared to concede Ceylon's demands.

Ceylon has already fulfilled her contract with the United Kingdom for this year by shipping 40,000 tons in terms of coconut oil. Pakistan has also received almost the entire quantity of 8000 tons in terms of coconut oil, which the 1949 U.K. contract provided for.

The British delegates to the talks, Mr. L. G. Fisher and Mr. G. Wigglesworth, of the Oils and Fats Division of the Ministry of Food, left for London by air at the conclusion of the talks.

Prices Rise in Canada

SEVERAL drastic price increases have lately taken effect in the chemical fields in Canada, reports the Toronto Purchasing Agents' Association. Caustic soda and chlorine were advanced $5 per ton in carload quantities in order to meet increased cost of equipment, maintenance and freight charges. Trichlorethylene advanced $1 per cwt.; perchlorethylene advanced 75 cents per cwt. and 66 per cent ammonia advanced $1 per cwt. There was no increase in the price of anhydrous ammonia in tank cars. The price of some industrial alcohol was decreased 5 cents per gal.

These advances contributed to the 3 per cent increase in the price of glass announced on October 28, due partially to chemical advances in conjunction with rising costs of freight, maintenance, etc. There have been no changes yet in such items as soda ash and coal chemicals.

Further increases in the chemical field are expected in the coming months.

INDIAN SHELLAC REVIVAL?

Hope of More Competitive Prices

AN expected bumper crop of shellac, and the devaluation of Indian currency are factors which are expected to help substantially to re-establish Indian shellac in hard currency areas where, in recent years, demand has been reduced by competition of the synthetic resins.

The Government of India has requested the Bengal Government to ban forward trading in shellac, which is expected to end speculation and to steady prices.

The synthetic product is dearer than genuine shellac, and according to current crop estimates, a decline in the price of the natural product is indicated.

Annual exports of shellac from India total about 27,000 tons, their value being Rs.9 crores. In 1948 shellac accounted for 2.3 per cent of India's total exports, as against 0.7 per cent in 1938. More than half the exports in 1948 went to hard currency areas. At present about 94 per cent of India's production is exported.

Prices during the past few months have ranged between Rs.140 and Rs.160 per maund. A report issued by Dr. P. K. Bose, Director of the Research Institute at Ranchi, after his recent tour abroad, states that if India wants to capture the world market the price of shellac should be established at about Rs.100 per maund.

Important Vitamin Synthesis

A CONCENTRATE of vitamin B_{12} obtained from deep-fermentation of the mould streptomyces, has been marketed by Glaxo Laboratories, Ltd., Greenford, Middx., under the name of Cytamen. It will be remembered that the isolation of crystalline vitamin B_{12} from liver was achieved simultaneously last year by Dr. E. Lester Smith, senior biochemist of Glaxo Laboratories, and by an American team headed by Rickes. Cytamen is a practical result of that and the new knowledge gained in 18 months of intensive laboratory and clinical work.

Extensive clinical trials have established that vitamin B_{12} from streptomyces produces, on injection, all the known anti-anaemic and other effects of liver extract. It is also stated to have the same beneficial effect as liver extract on the degeneration of the spinal cord complicating some cases of pernicious anaemia.

The prime value of Cytamen is in making the treatment of pernicious and other macrocytic anaemias independent of supplies of liver.

WORLD POWER CONFERENCE

Programme for 1950 Meeting in London

WORLD Energy Resources and the Production of Power will be the theme of the Fourth World Power Conference to be held in London from Monday, July 10, to Saturday, July 15, next year. Programme and full particulars, together with instructions for attendance, have now been issued as a booklet printed in English and French.

The conference begins with an opening session at the Central Hall, Westminster, in the afternoon of Monday, July 10, and a reception by H.M. Government in the evening at the Science Museum, South Kensington. Technical sessions will be held each morning and afternoon up to and including Friday, July 14, in the buildings of the Institutions of Civil, Electrical and Mechanical Engineers.

On Tuesday evening (July 11) there will be a reception at the Guildhall, and an official banquet on Thursday evening (July 13).

The closing session will be on Saturday morning (July 15) in the building of the Institution of Civil Engineers.

A number of study tours has been arranged for the week following the conference. Itineraries have been arranged so that visits to places of historical and scenic interest are included as well as visits to industrial and other installations of purely technical concern. A number of day and half-day excursions from London have also been planned.

The technical programme has been divided into three main divisions: Energy Resources and Power Developments; Preparation of Fuels; and Production of Power.

In order that the time available may be available for discussion, papers will not be read at the conference but will be printed and distributed, and General Reporters appointed who will summarise the subjects and suggest subjects for discussion.

Altogether, 159 papers from 27 different countries have been announced, Great Britain contributing 23, the U.S.A. 20, and France 18. A full list of papers (corrected to October 27, 1949) is issued with the programme, and includes the following subjects:—

Belgium:	Underground Gasification.
Czechoslovakia:	A New Method of Thermally Controlling Coking Processes. Increasing the Output of Coke Oven Plants.
Great Britain:	A Review of Some British Carbonisation Problems; Use of Heavy Petroleum Fuels for the Production of Power; Preparation and Utilisation of Fuels from Coal Tar; The Recovery of Benzol at Gas Works and at Coke Ovens; Nuclear Fission.
Ireland:	The Winning and Utilisation of Peat.
Sweden:	Recent Development Possibilities by Means of Modern Retorts for Oil Shale and Modern Boilers for Shale Coke.
U.S.A.	Advances in Petroleum Refining; Synthetic Liquid Fuels; Transportation, Storage and Peak Load Supply of Natural Gas; Manufacture of Fuel and Synthesis Gas in the United States.

Chemical Exchanges with Japan

FRESH trade arrangements between Japan and countries in the sterling area have been put forward as a result of talks with the Supreme Command for the Allied Powers (SCAP).

Commodities to be purchased from the sterling area include rubber, salt, petroleum and tanning materials, while purchases from Japan will include chemicals, glassware and some electrical products.

Purchases by Japan from the sterling area countries concerned are expected to be worth approximately £55 million, and commodities from Japan may total £45.5 million during the 12 months July 1949 to June 1950.

Countries of the sterling area concerned are the United Kingdom and the Colonies (excluding Hong Kong); Australia, India, New Zealand and South Africa.

Chemical Employment

NUMBERS employed in the chemical and allied trades in Great Britain in September again showed a slight increase over the previous month.

Figures published in the latest issue of the *Ministry of Labour Gazette* show sectional distribution as follows:—

Industry	Thousands Sept. 1949	Aug. 1949	Mid. 1948
Coke ovens and by-product works	17.4	17.6	17.3
Chemicals and dyes	199.1	197.9	195.5
Pharmaceutical preparations etc.	34.3	33.8	30.8
Explosives and fireworks ...	36.9	36.2	33.8
Paint and varnish	38.1	38.1	37.0
Soap, candles, glycerine, etc.	49.0	49.0	46.9
Mineral oil refining	35.8	35.4	30.7
Other oils, greases, glue, etc.	30.4	30.3	28.9
Total chemical and allied trades	441.0	438.3	420.9

Basic Chemicals in September and October

Non-Ferrous Metal Stocks Improve

PRODUCTION of sulphuric acid materials in September showed all-round increase over the previous month and over September 1948. Consumption of liming materials was higher than in August and also greater than the same period last year. Stocks of non-ferrous metals were markedly higher than in 1948.

Another small increase occurred in the estimated numbers employed in all sections of the chemical and allied trades, totals for September being (in thousands) 441.0 compared with 438.3 in August. Distribution of workers in September was as follows: coke ovens, chemicals and dyes, explosives, etc., 253.4 (185.1 men, 68.3 women); paints and varnishes 38.1 (26.8 men, 11.3 women); oils, greases, glue, etc., 66.2 (52.6 men, 13.6 women); pharmaceutical, toilet preparations, etc., 83.3 (41.5 men, 41.8 women).

These figures and the table given below are abstracted from the latest issue of the *Monthly Digest of Statistics*, No. 47.

	September, 1949 Thousand Tons			September, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	144.0*	140.0	—	131.3*	133.0	—
Sulphur	—	27.0*	175.2*	—	23.4*	72.5*
Pyrites	—	19.2*	67.0*	—	19.1*	63.0*
Spent oxide	—	16.2*	175.2*	—	16.7*	162.9*
Molasses (cane and beet)	11.7	25.9†	221.8	8.5	26.8†	197.5
Industrial alcohol (mil. bulk gal.) ...	1.91	2.27	3.91	1.87	2.11	9.43
Superphosphate	17.2	18.7	—	16.6	17.5	—
Compound fertiliser	162.8	143.2	—	151.2	126.2	—
Liming materials	—	546.7	—	—	367.6	—
Ammonia	—	6.17*	4.20	—	6.7*	5.44
Nitrogen content of nitrogenous fertilisers	19.79	22.61	—	19.64	21.5	—
Phosphate rock	—	84.9	255.3	—	80.4	193.2
Virgin aluminium	2.44	15.1	—	2.49	15.3	—
Virgin copper	—	31.0	145.2	—	31.7	123.2
Virgin zinc	—	18.4	73.9	—	20.0	55.7
Refined lead	—	19.4	63.4	—	21.4	18.6
Tin	—	2.09	23.5	—	2.3	16.6
Zinc concentrates	—	12.4	64.0	—	15.2	31.0
Magnesium	0.24	0.35	—	0.34	0.43	—
Pig iron	184.0*	—	506.0*	183.0*	—	281.0*
Steel ingots and castings (including alloys)	307.0*	—	1,331.0	297.0*	—	1,003.0
Rubber: Reclaimed	0.41	0.47	2.65	0.52	0.53	3.81
Natural (including latex)	—	3.73	47.4	—	4.08	63.4
Synthetic	—	0.05	1.45	—	0.05	2.13

* October. † Distilling only.

British Fertilisers Team Returns

THE fertilisers productivity team, which has been on a 6-weeks' tour of the U.S.A. (THE CHEMICAL AGE, 61, 550 and 604) to study production methods, inspect plant and exchange information with representatives of the American industry, returns on the s.s. *Queen Mary* to-day (Saturday).

The team's complete itinerary, which included visits to a number of plants along the east coast and attendance at the autumn convention of the National Fertiliser Association, was as follows:

November 3-8: Conference with ECA officials and officials of the American Agricultural Chemical Company, New York, and Boyce-Thompson Institute of Plant Research, Yonkers, N.Y.; November 9: National Fertilizer Association, Washington; November 10 and 11: Tennessee Valley Authority, Florence, Ala.

November 14-16: National Fertilizer Association convention, Atlanta, Ga.; November 17: International Minerals & Chemical Corporation, Atlanta, Ga.; November 18: Empire State Chemical Company, Athens, Ga.; November 21; Georgia Fertilizer Company, Valdosta, Ga.

November 22-28: Swift & Co., International Minerals & Chemical Corporation and Gulf Fertilizer Company, Tampa, Fla.; November 29: Citrus Experiment Station, Lake Alfred, Fla.; November 30: Study of phosphate rock loading docks and handling facilities, Tampa and Boca Grande, Fla.

December 2: Virginia-Carolina Chemical Corporation, Richmond, Va.; December 5: Department of Agriculture, Beltsville station, Md.; December 6: Department of Agriculture, foreign agricultural relations division, Washington; December 7: University of Maryland, agricultural experimental station, College Park, Md.

December 8: Southern States Cooperative, Culpeper, Va.; December 9: Meeting with ECA officials and Press conference, Washington; December 12: Davison Chemical Corporation, Baltimore, Md.; December 13: American Agricultural Chemical Company, Carteret, N.J.

WATER POLLUTION LEGISLATION

Specialist Committee's Proposals for a New Act

CHANGES with far-reaching effects upon the safeguards which industries and other interests would be obliged to take to minimise the discharge of noxious material into streams and rivers are outlined in the publication newly issued by the Ministry of Health, "Prevention of River Pollution,"* which presents views and some of the evidence of a specialised committee, under the chairmanship of Mr. S. R. Hobday, which has studied the subject at 33 meetings since its appointment in June 1946.

The committee's appreciation of the water pollution from all sources to-day is evidenced by its comment that "The need for the improvement of the condition of rivers and streams in many parts of the country can hardly be exaggerated". Much of that deterioration, it is said, is of recent origin.

The proceedings appear to have given appropriate weight to the predominant influence of sewage outflow in most instances of water pollution and to the heavy flow of mine water in some areas. The latter intractable phase of the work is likely to be the subject of further discussion with the National Coal Board.

A Fresh Start

All the committee's recommendations are framed to strengthen the effectiveness of the River Boards, which are to be set up under the authority of the River Boards Act, 1948, and which will be the regulating authorities for nearly all purposes. To do that effectively, the committee considers that a new Act of Parliament is essential, rather than a series of amendments of the Rivers Pollution Prevention Act of 1876, many of whose provisions are anachronistic. It is not proposed that the legislation contained in the subsequent Acts should in general be amended. That, too, will be administered by the River Boards.

The committee's report sets out the principal respects in which existing legislation affecting the subject should be changed in a new Act and has a number of subsidiary proposals, many of which would confer comparatively wide powers on the River Boards to frame byelaws.

The following are the principal changes recommended:—

The separate provisions relating to sewage pollution and industrial pollution should be replaced by a comprehensive provision making it an offence to allow offensive or injurious matter, solid or fluid, to enter a stream. The separate provisions in Section 5 for prevention of pollution from mines should not be continued, but the reservation relating to mine water which enters a stream in the same condition as that in which it has been drained or raised from the mine should be retained pending technical investigation.

The provisions in Sections 3 and 4 of the Act relating to discharge through a channel, etc., in existence at the date of the passing of the Act, or through a substituted channel with an outfall at the same spot, should be repealed.

Standard of Effluents

A River Board should be able to prescribe standards with which effluents discharged into a stream or part of a stream must comply; effluents which do not comply with a standard should be deemed to be offensive or injurious.

The standards should be prescribed by byelaws subject to confirmation by the Minister of Health, and the procedure for making byelaws should be that laid down in Sections 18 and 34 of the Act of 1948, with the following modifications.—

(a) Three months' notice should be required of a proposal to submit byelaws for confirmation;

(b) the Minister should be required to hold a local inquiry if objections to confirmation of byelaws are received from persons he considers to be interested.

Compliance with a standard should be a defence against proceedings under Section 8 of the Act of 1923. A byelaw fixing a standard should not be confirmed until a proper survey of the stream or part of a stream has been completed. A River Board should be required to submit to the Minister of Health a report of any completed survey of a stream of part of a stream.

A River Board should be able to take proceedings in respect of polluting matter which does not reach a prescribed standard, without consent of the Minister of Health.

Proceedings should not be taken, without the consent of the Minister of Health, in respect of liquid effluent from industrial, manufacturing and mining undertakings if no standard has been prescribed for the stream, or if the proceedings are in respect of properties of an effluent for which no standards are prescribed.

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* Prevention of River Pollution (Report of the Rivers Pollution Sub-Committee of the Central Advisory Water Committee appointed by the Minister of Health). HMSO, 1s. 6d

The Minister should be required, before giving his consent to proceedings, to consider whether the best practicable means of treatment, within a reasonable cost, are being used; if they are not being used, he should (if he thinks it reasonable) give the person concerned an opportunity of obtaining and using them.

New Outfalls

It should be an offence to open into a stream any sewer, drain, etc., unless the consent of the River Board has been obtained; the Board should be entitled to attach terms and conditions to their consent: consent should not be unreasonably withheld and any difference on a question whether consent should be granted, or whether the conditions imposed are reasonable, should be determined by the Minister of Health. That provision would not apply to the Manchester Ship Canal.

Consent should not be required to a new opening for the discharge of effluent from the sewage disposal works of a local authority if the work has been approved or authorised by the Minister, or if he has consented to a loan to meet the cost.

Four weeks' notice should be given to the River Board of any proposals which involve radical changes in the volume, nature or rate of discharge of any liquid effluent being discharged into a stream.

The provisions relating to solid matter should deal with all solid matter except offensive or injurious matter which would be within the scope of the provision proposed in the first recommendation. They should follow in principle Section 43 of the Act of 1938, and should also prohibit the placing of offensive or injurious matter on the banks of a stream so that it may drain or pass into the river.

Because of the impracticability of avoiding the spilling of spoil into waterways in some mining areas, partial exemption of mines and quarries from the effect of this provision is proposed.

The provisions dealing with solid matter should not relate to suspended solid matter, unless the Court is satisfied that the suspended matter which has been allowed to pass into a stream is obstructing or is likely to obstruct the due flow of the stream.

Full powers for the prevention of river pollution should apply to tidal waters only where so determined by order of the Minister of Health, after a local inquiry. The Minister, in exercising this power, should not be restricted to "sanitary grounds" but should be able to take any relevant circumstances into consideration. He should have an additional power, by order, and after local inquiry, to extend particular provisions of the law to tidal waters.

Parliamentary Topics

THE Under Secretary of State for Foreign Affairs (Mr. C. P. Mayhew), replying to Mr. W. Fletcher, affirmed that Western Germany will not be permitted to make synthetic rubber, although the factories concerned had not been dismantled.

SULPHURIC acid purchases by the Government were the subject of questions in the House of Commons last week. In reply to Mr. J. Boyd-Carpenter, the President of the Board of Trade (Mr. Harold Wilson) said that the exemption of such purchases from price control was only to cover research establishments in areas where there were no other consumers on the basis of which it would be possible to fix a fair price. Mr. W. S. Shepherd asked whether the difference in price was not, in fact, caused only by variations in the cost of delivery.

IN a written reply to Mr. Raymond Blackburn concerning atmospheric pollution, the Minister of Health (Mr. A. Bevan) said that eight local authorities had taken powers to establish smokeless zones, 17 to control the emission of smoke from new furnaces and 18 to provide district heating, and the City of London had taken power to extend its by-laws for regulating smoke. The Minister said that he had asked all local authorities to select types of appliances that burnt smokeless fuel for installation in new houses, and that he had approved a number of experimental district heating schemes.

REFERRING to the report of the Water Softening Sub-Committee, the Minister of Health, in a written answer to Mr. H. A. Nutting, stated that it was not possible at present to divert labour and materials to water softening projects, though he was prepared to consider any schemes that might be submitted to him in general.

NATURAL GAS IN SOUTH-WEST FRANCE

Industrial Applications Saving Dollar Imports

EXPLOITATION of oil and natural gas resources in South-West France, notably in the Montpellier and Saint-Marcet regions, is now engaging the attention of some important oil concerns. Initial development work was undertaken before the war and, at present, three companies are known to be exploiting some 8.5 million acres. The companies are: Régie autonome des Petroles, Soc. nat. des Pétroles d'Aquitaine, and Soc. nat. des Pétroles du Languedoc méditerranéen. All are collaborating closely with the Service de Recherches de Pétrole en France. A fourth company—Standard français de Pétroles—has lately requested exclusive rights over large areas in the La Rochelle, Cognac, and Bicarosse regions.

A fairly complete record by M. Marcel Turon, of developments in this part of France, is reproduced in part in the French review *Etude et Conjoncture* (1949, *4* (2), 63-96). They also form the subject of a detailed and well illustrated study by Georges Génin, entitled " Les gaz naturels de Saint-Marcet et leur utilisation " in *Chim. et Ind.* (1949, *62*, 503-509).

Vast Reserves Possible

Most substantial progress appears to have been made by the first named company, the R.A.P., from nine borings in the Saint-Marcet and Proupiary districts, at least one of which yields petroleum as well as gas. The latter is nearly pure methane (about 92 per cent) with some ethane and other paraffins, and nitrogen. Yields at 15°C. and 750 mm. pressure have increased from 9 million cu. m. in 1942 to 174 million in 1948. The latter figure is by no means the maximum possible, for it is limited by transport facilities and other factors. Total probable reserves are difficult to estimate, but a figure of 7000 million cu. m. has been given by specialists.

The gas undergoes double treatment, first to recover the liquid hydrocarbons—butane, etc.—and then a petrol removal or total elimination of condensible constituents. This double recovery enabled about 730 tons per month of finished products to be sold in 1947. The gas may be used directly as domestic or industrial fuel, as a substitute for petrol, and in various syntheses.

In the first category—domestic or town gas—the high calorific power (9500) as compared with 4500 for coal gas, requires that suitable domestic apparatus should be provided, or that the gas be modified to suit existing apparatus, as, for example, by admixture with gas of lower calorific power. It is thus possible to obtain a whole range of gas mixtures approximating that of coal gas and with a calorific range from 2000 to 9000. By using some of these methods in French towns a great saving in imported fuel has been effected, estimated at $2.16 million.

Adopting Gas

In the industrial category, many steel works, paper works, distilleries, ceramic, fertiliser and other factories, etc., are gradually replacing existing plant with gas heating for steam raising or other purposes. In many steam plants efficiency of boilers increased by 50-80 per cent, and production capacity by at least 30 per cent. These advantages are particularly marked with Martin steel plant and furnaces and the absence of sulphur in the gas is a very favourable factor in the production of special steels.

In 1947 nearly 60 million cu. ft. was sold to local industry, and receipts rose to Fr.213 million. Average price in 1947 rose from Fr.3.37 to Fr.5.32; 118,000 tons of coal was saved, equivalent to $2,124,000.

Natural gas in pressure cylinders is also being increasingly used for heavy motor vehicles. It has certain advantages, such as a high octane number (125) allowing a compression ratio of 15. In 1947, 32 million cu. m. were sold, replacing petrol to the value of $2.1 million. A total saving of about $7 million, representing 18 per cent of crude oil imports from the U.S.A., has thus been effected. Imports will be further reduced when the Saint-Marcet output is increased to 1 million cu. m. per day.

The economics of the different uses for natural gas in France, which include the manufacture of hydrogen, is discussed and a price policy considered.

In conclusion, the respective amounts of power available per head of population in the U.S.A. (15,000 kW) and in France (1900 kW) are compared. There is thus plenty of scope in France economically to increase available power supplies.

SCIENTIFIC MANPOWER

Survey of Supply and Demand for Chemists

THE present and future demand for and supply of the professionally qualified scientists and technologists who will be needed in Government service, industry, research and teaching over the next five years, and the numbers of people likely to be available who could be trained, have been surveyed in five reports just published by the Ministry of Labour and National Service.

The report devoted to the profession of chemistry states that, in comparison with 1938-39, the number of full-time students reading pure science for a degree has more than doubled in the session 1948-49. In estimating the future demands for chemists, the sub-committee on chemistry of Lord Hankey's technical personnel committee agreed that the minimum standard that should be considered would be "chemistry taken as a finals subject for a first degree in science."

Probable Normal Recruitment

We recognise, states the sub-committee's report, that any survey such as we have carried out can be neither exhaustive nor precise. The estimates discussed are based on probable normal recruitment. This may be fundamentally altered by changes in the industrial situation. It is emphasised by the University Grants Committee that the great increase in the student population clearly calls for something like a corresponding increase in the number of staff, and that there is also a general sense that the ratio of staff to students ought to be improved. The full implications of doubling the number of science graduates as advocated by the Barlow Committee are not always appreciated.

We recognise that the adequate staffing of departments of chemistry in the universities and university colleges is vital if the quality of the training for chemists is to be maintained. Moreover, as most of the future demands for chemists assume that there will be a large extension of facilities for post-graduate research, there must be a full appreciation of this fact when priorities in the allocation of labour and materials are under discussion for university buildings. Also the Barlow Committee did not overlook the technical colleges and institutes as an important source of supply of scientists, and it may well be that in the future many young scientists will secure their qualification by full-time attendance at these.

It is apparent that the employment of chemists in industry is not restricted to essentially scientific work and that industry can provide employment for many types of chemical graduate in which academic qualifications, general ability and good personality are all of importance. It also appears that the number of graduates in chemistry not acceptable to industry nowadays is relatively small and consists of men with mediocre academic qualifications combined with lack of personal qualities.

The report deals at length (page 829, this issue) with the encouragement which the sub-committee suggests is given to too many young men undertaking post-graduate training to regard research in pure science as the only worth-while career for a chemist.

On the shortage of well-trained chemists, the report states, there seems to be general agreement that recruitment is especially difficult in the fields of physical chemistry, biochemistry and specialised analytical chemistry. It is felt that many potential physical chemists are deterred from taking up this subject because they lack the basic training in mathematical subjects which is required. It is suggested that the drawing up of a syllabus in mathematics and physics necessary for a career in chemistry would be of great value to both schools and universities.

Analysts

We (the sub-committee) share the concern of Government departments and industry at the scarcity of chemists having training and ability to deal with the analytical problems of modern science. During the last two or three decades the status of the analyst has fallen and the belief has grown up that the post of analyst can be filled by the unadventurous and the uninspired. As a result there is a great dearth of suitable men and women analysts.

There is a need for chemists and physicists of the highest calibre to plan the application of modern analytical techniques to the problems arising in research or production departments and to develop new methods. The revival of interest in this subject in the universities is a matter of urgency, and equality of status and opportunity should exist in industry between chemists or physicists engaged in this work and chemists engaged on any other type of work.

The University Grants Committee has submitted details of the output of honours graduates in pure or applied chemistry over the next few years, and we agree that the probable output would be of the order of 900 graduates per annum, of whom 60 per cent would qualify for a good honours degree. In addition, there must be added the honours graduates from schools of chemistry outside the scope of the University Grants Committee, and we estimate these at 125 per annum. Also, of those who will graduate each year with chemistry as part of a pass degree, it may be expected that at least 400 will be prepared to take up a career in chemistry.

A considerable number of students of chemistry attain their professional qualification by taking the examinations of the Royal Institute of Chemistry. In 1948, the number of candidates examined was 287, of whom 123 passed. The supply position, from all sources, may, therefore, be summarised as follows.—

	Nos. each year over next 5 years
Honours graduates	1,025
Pass graduates	400
A.R.I.C.	125
Total	1,550

All this adds up to a grand total supply over the five years of 7750.

Industries Employing Chemists

On the subject of demand for chemists the report deals with industry under two main heads—the chemical industry itself and all other industries employing chemists.

The chemical industry is not one industry but innumerable industries which are all linked by the fact that they are based on the science of chemistry. Unfortunately, there is no generally accepted definition as to the constitution of the chemical industry so that its scope varies from country to country. Some idea of the range of industries in the grouping of chemical industries is given in the following list, which is classified according to the method used by the Association of British Chemical Manufacturers:—

Group A. Heavy chemicals—all inorganic acids, alkalis and other heavy chemicals, including fertilisers.

Group B. Fine chemicals—medicinal, pharmaceutical and allied; laboratory; photographic; rare earth; synthetic aromatics, perfume, isolates and their derivatives and allied; technical; acetone, alcohols, ethers and their derivatives; solvents and plasticisers.

Group C. Coal tar distillation products, excluding ammonia and ammonia products.

Group D. Dyestuffs and explosives and their intermediates.

Group E. Fats; glycerine; greases; soaps.

Group F. Pest control products—disinfectants; insecticides; sheep and cattle dips; veterinary medicines.

Group G. Other chemicals and allied products and industries, including gelatines, glues and sizes; plastics; paints, varnishes, enamels, lacquers; resins, tanning material not elsewhere covered; oil distillation products.

Consulting Chemists

In considering the position of the chemist in industry it will be apparent that under modern conditions the chemist finds employment in a wide range of industrial activities outside what we have defined above as the chemical industry. For example, the metallurgical industries, the petroleum industry and activities associated with the supply of food and drink, textiles and clothing, employ a large number of chemists in a variety of posts. Industry also calls to its aid the consulting chemist and the consulting analyst.

In assessing the probable demands of industry, therefore, the first task is to estimate how many chemists are normally employed both in the chemical industry itself and in other industries. In a recent survey of scientific man-power undertaken by the Ministry of Labour and National Service the replies to questionnaires completed by individual scientists indicated that some 12,000 chemists were in industrial employment. This figure is supported by other considerations.

From an examination of the particulars given in the list of members of the Royal Institute of Chemistry, we concluded that as many industrial chemists were employed outside the chemical industry as within it. We have ascertained that some 166 firms in the Association of British Chemical Manufacturers employ 5400 chemists and that this includes the large concerns. To suppose that the 56 firms who did not reply to the questionnaire employ about 600 chemists seems a not unlikely assumption, whereby we conclude that approximately 6000 chemists are in posts in chemical industry and 6000 chemists are employed in industries outside. The next necessity is information on which to form estimates of the probable future intake of chemists to replace wastage, to make good deficiencies in present establishments and to permit any expansion which is planned in the chemical industry and in other industries.

Help from ABCM

The director and secretary of the Association of British Chemical Manufacturers gave us most valuable assistance by sending to its members a questionnaire. The number of firms receiving this communication was 222 and replies were received from 166 firms. The 166 replies included all the major chemical firms. An analysis of the data which were supplied in answers to the questionnaire is given below:—

(1) Number of chemists employed in 1948 by 166 firms.

(*a*) Research	1,961
(*b*) Development	620
(*c*) Production including process control	1,671
(*d*) Technical sales	363
(*e*) Administration	459
(*f*) Others	288
	5,362

(2) Estimate of number of chemists to be employed in 1953.

(*a*) Research	2,721
(*b*) Development	1,079
(*c*) Production including process control	2,442
(*d*) Technical sales	461
(*e*) Administration	522
(*f*) Others	264
	7,489

(Sixteen firms answering the questionnaire stated they were unable to estimate their requirements in 1953. In these cases the figures for 1953 are taken as being the same as for 1948 and the 1953 figures will be, therefore, an underestimate.)

The figures show that the number of chemists to be employed by the selected firms should increase during the next five years by some 40 per cent. If we apply this percentage increase over the whole field of the chemical industry, *i.e.*, 6000, it follows that the number of chemists employed in the chemical industry may be expected to expand over the next five years by some such figure as 2400, *i.e.*, the numbers whom this industry will wish to employ will increase from 6000 to 8400.

If we assume, as was done in the Barlow report, that the scientist spends 30 years in active work, then over five years approximately 1000 new chemists will have to be taken on to replace wastage in the chemical industry. Adding this to the "expansion" figure above, we get a need for new chemists in the chemical industry over the next five years totalling 3400.

Turning to the needs of other industries, it is necessary for our purposes to subdivide the firms into those in industries for which there are research establishments and those in industries without such establishments. In regard to the former, we find, basing ourselves on information obtained from a sample inquiry, that whereas firms in this category and their research associations have at present a staff of 3140 chemists, they hope over the next five years to increase this number by 60 per cent, which works out in round figures at an increase of 2000. The other firms (*i.e.*, those not connected with research associations) at present employ approximately 3000 chemists. No estimates are available about probable expansion in this sphere. It would seem, however, that it would be wrong, in the light of the foregoing, not to assume some expansion in this sphere also. A figure of 20 per cent is not unlikely, and this would mean an extra 600 men.

If we make the same assumption on wastage as we made in regard to the chemical industry, we have once again to provide, over the five years' period, for 1000 new recruits to make good normal wastage in those industries (other than the chemical industry itself) which employ chemists. This, added to the "expansion" figures as estimated in the previous paragraph (2000 and 600) produces a grand total in this sphere of 3600.

Estimated Needs

To summarise the position in a table, the estimated needs of industry for new chemists over the next five years can be set out as follows:—

To replace estimated wastage (chemical industry and other industries employing chemists)	2,000
To provide for estimated expansion in the chemical industry	2,400
To provide for estimated expansion in other industries	2,600
	7,000

The replies to the questionnaire received from members of the ABCM gave interesting information on the need for men with different qualifications. 136 out of the 166 firms gave estimates of their requirements for chemists with first or second class honours degrees. For the year 1953, these would amount to 1700 chemists out of a total of 7500 chemists it is hoped to employ. This emphasises that there is a place within the industry for a man with academic qualifications other than a first or second class honours degree. At the same time it must be pointed out that this ratio of first and second class honours men to the chemists with lower qualifications is very different from that given to the sub-committee by representatives of some of the larger firms.

For example, in one large firm it was estimated that on the research side of the organisation the distribution was: First and second class honours 83 per cent; third class honours and pass degrees 17 per cent. In the works the distribution was: First and second class honours 78 per cent; third class honours and pass degrees 22 per cent.

An analysis of the academic qualifications of chemists employed by a large oil company may also be quoted

	1st or 2nd Class Hons.	Ord.
Research and development ...	132	10
Production	70	9
Technical administration ...	46	12
Sales service/Techno-commercial	34	15
Sales (including export) ...	3	—
Divisional directors and executive staff	32	—
Education	2	—
Staff and labour	1	—
Total	320	46

The Physicist in Industry

Insufficient Interest in the Fundamentals

ONLY in recent years have opportunities for physicists in industry been reasonably fully developed. This is one of the conclusions reached in the report on " Present and Future Supply and Demand for Persons with Professional Qualifications in Physics," prepared by a physicists' sub-committee of the Technical Personnel Committee for the Ministry of Labour. The report represents the only generally available summary of facts relating to numbers employed, requirements of particular industries, etc.

A limited number of good men is needed for industrial research. Shortage of men of the right type interested in classical physics (such as thermodynamics and optics) is particularly noticed, and it is recommended that this essential department should not be allowed to suffer because of the greater modern appeal of atomic and nuclear physics.

There is a larger demand for physicist-engineers, the report observes—men with a physics degree who also have the practical outlook of the engineer and are keenly interested in applying their knowledge of physics to industrial problems.

Grants for Training

Men who wish to enter industry and have no special aptitude for original research should be encouraged to obtain additional training in some branch of engineering or technology.

This training might well consist of a further year's course in the appropriate branch and arrangements should be made for grants to be available to men who take such a course.

Alternatively, the training could take place in industry, in a form comparable with the graduate apprenticeship of an engineer although of shorter duration.

In making forecasts of future requirements there are many factors beyond the control of the organisations which have supplied the sub-committee with information.

The most obvious of these is the undoubted effect which changes in the general economic situation of the country would have on the estimates. There is evidence that the shortage of physical space in laboratories and workshops is to some extent restricting the number of new staff which can be engaged and the building programme may therefore have its effect on requirements.

Future Needs

At this stage it is not possible to assess the extent to which new developments such as the introduction of electronic control equipment will affect the demand for physicists, and the use of operational research methods may, if it becomes widespread, make an additional call on scientific manpower.

There is a number of posts on the borderline between physics and other subjects, such as mathematics, engineering and chemistry, for which it is difficult to decide whether a physicist is required or another scientist, or a man qualified in more than one subject. In making our estimates, we have done all that is possible to take account of this.

The report provides in tabular form a summary of requirements from all sources:—

(continued overleaf)

AVERAGE ANNUAL DEMANDS FOR PHYSICISTS

	1948–50	1951–55	1956 onwards
Industry ...	250	250 decreasing to 150	150
Research assns.	30	30 decreasing to 20	20
Government depts. ...	175	50	50
Teaching ...	350	350	225
Universities ..	20	20	20
	825	700 decreasing to 590	465
Misc. 5% ...	40	30	25
Total ..	865	730 decreasing to 620	490

It would appear that during the next few years the supply of physicists is likely to be rather less than the demand; this slight shortage may continue for about five years although the difference between supply and demand becomes progressively smaller until it is clear that after 1952 there is a possibility of over-supply of physicists.

A purely quantitative assessment of the position may, however, prove misleading and it is essential that quality must be borne in mind when comparing figures for supply and demand.

There is a number of highly intelligent men and women who reach the standards set for entry to a university, but who find that the advanced work in the final parts of their courses is beyond their powers, the report continues. They only achieve a place in the lower grades of the honours finals, or perhaps graduate with a pass degree.

At the same time they often possess valuable personal qualities and abilities in spheres other than the purely academic. There are many posts which this type of person could fill satisfactorily and possibly with greater success than some of the men who obtain high honours.

These facts do not seem to be sufficiently appreciated, and there is evidence that it is becoming habitual for some employers and Government Departments to insist on first or second class honours degrees for any posts for which they require a physicist.

If this persists, there is a danger that the standards at present maintained in final examinations may tend to be lowered.

We feel strongly that any reduction in this standard would be deplorable. It is for these reasons that all employers should realise the danger of over-emphasis on academic standard, and a good honours degree should not be stated as essential for posts for which this qualification is not really essential.

Twenty-nine More Candidate Chemical Engineers

A SUBSTANTIAL increase in the number of candidates for the associate membership examination of the Institution of Chemical Engineers—of 29 to a total of 115—is recorded in the examiners' report. Fifty-six sat for the full examination and 39 took only the home papers. Twenty were concerned only with subjects in which they had failed previously.

Of the total, 61 were successful (53 per cent), 23 in the full examination, 28 in home papers and 10 in particular subjects.

The examiners' report, while it recognises that the examination represents a severe test of understanding of fundamental principles, capacity for orderly treatment and hard work, suggests that the percentage of passes (4 per cent fewer than in 1948) reflects a slight lowering of candidates' ability. There were some outstandingly good papers, but fewer than in most previous years. They note, for example, that papers C, D and E disclosed that many candidates had learned formulae without understanding the fundamental bases, so that some were incapable of performing a simple calculation in an unfamiliar form.

The successful entrants were:—

Henry Andrew ANSON, Frederick Stanley BEARDMORE, Albert BOOTH, John McNicol BRUCE, Jack William BRUCE, Austin George CARTER, Philip Victor Charles COLEBROOK, Derrick Gwynn CROXON, Roy Vernon CULVER, Egidius Franciscus du MAINE, Kenneth Clarke FISHER, Hugh John FOXCROFT, Donald Cole FRESHWATER, Raymond Douglas GARMANY, Alan Crofton GODFREY, Cyril GREEN, Joseph John GRIFFITHS, William Frederick HARRIS, Harry Ronald HEWITT, Walter Howard HUSBAND, Philip Penry JONES, Bernard George LIMMER, Leslie George LUDLOW, Aric Lavinus LUY, Alan Bruce McKELVIE, Ivan Morris MADDERN, John Herbert MERCER, John Desmond MITCHELL, Cecil Denis Bradley MOON, Donald Roland NEALE, Alan Hedley NORRIS, Derek John OLIVER, James OWEN, Ronald PARKER, Malcolm PEARCE, Denis Arthur POLKINHORNE, John Scott POLLARD, Edmund POULSOM, David Elwyn ROBERTS, Sydney Albert ROBINSON, Leslie David ROLAND, Kenneth Evans SCANLON, Michael SHAW, Eric SHORT, Robert Hall SIMPSON, Harold Aitken SLADE, Sydney Ernest SMITH, Henry Joseph Maxwell STEPHENSON, Brian Edward Alston THOMAS, Jack THOMPSON, Peter Arnold TOYNBEE, Dirk van BLADEREN, Jan van OORSCHOT, David Sweetnam VICKERY, Norman Ernest WARD, Geoffrey WATERHOUSE, Richard John WAUGH, Alfred Wilfred WEBB, Ivor Norman WELLINGS, Gerald Douglas WILLIAMS, James Bryan Lonsdale WORTHINGTON.

STANDARDISED LABORATORY PRACTICE

Safeguarding Chemical and Control Tests

CONTROL tests to ensure uniformity in making tests and the manner of expressing results when dealing with boiler water treatment have been summarised and issued as B.S. 1427.

The standard has been divided into three groups covering tests for water used in steam generation. The first group, A, is now available and can be used where no laboratory facilities are available.

The tests have been sub-divided to cover raw water, softened water, condensates and boiler water, and give detailed methods for the following determinations:—

Appearance. density, electrical conductivity, pH value, free carbon dioxide, alkalinities, total and ghost point hardness (Wanklyn method), alkaline hardness, non-alkaline hardness, calcium, magnesium, chloride, dissolved solids, phosphate, silica, copper, free chlorine, oil, sulphate, sulphite, dissolved oxygen, free and saline ammonia, aluminium, iron (dissolved, suspended and total).

Appendices are also included, giving information on the preparation of indicators and standard volumetric solutions, with tables of abbreviations, equivalents and conversion factors.

Cast iron pipe flanges and flanged fittings for the petroleum industry, class 125 and 250 are the subject of British Standards 1575 and 1576, now available. Both these have been prepared with special consideration of the American Standards Association requirements.

Details are given for the design and construction of flanges and flanged fittings and tables provided with all the necessary dimensions.

Conversion Tables

Another new issue by the British Standards Institution is addendum No. 1 to British Standard 350: 1944.

This contains additional definitions, conversion factors, multiples and tables relating to cubic measures, weights, pressures, force, concentration, and traffic units. A set of factors and multiples and a few extended tables for the conversion of units of thermal conductivity and conductance, heat flow and viscosity, are also included.

Attention is directed to the use which can be made of many of the basic tables, included in B.S. 350: 1944, for the conversion of derived units. All the tables provide for two-way conversions.

At the request of users of B.S. 350, the addendum contains an index of the definitions, factors, and tables included in the two books

Dangerous Reagents

The necessity for special precautions in the use of laboratory chemicals when carrying out analysis of iron and steel (B.S. 1121, parts 15 and 16) has prompted the British Standards Institution to publish a special standard, "Safety Precautions in the Use of Laboratory Chemicals for Metallurgical Analysis."

One of a series, it is intended to provide that working conditions and procedure in laboratories will minimise the danger of serious accidents, and to act as a medium of instruction in the safe handling of laboratory chemicals.

The standard (B.S. 1121A) will be issued in several sections, the sequence following, as far as possible, the use of particular reagents in B.S.1121. The first two sections now available cover general requirements and precautions in the handling of perchloric acid.

General requirements are divided into nine sub-headings dealing with cleanliness, storage, protection of workers, ventilation and neutralising agents. Fume cupboards, ducts and other structural work play an important part.

Attention is drawn to the customary precautions in fuming, the quantity of the reagent used in analytical work, protective garments and other means of preventing accidents.

Chemical Balances

AT a recent two-day meeting, held by L. Oertling, Ltd., manufacturers of balances and weights, at its head offices, 110 Gloucester Place, Portman Square, London, W.1, to which had been invited all area service representatives, works personnel and sales staff, the chairman, Mr. J. Rock Cooper, expressed his appreciation of the close liaison maintained with the men "in the field." He emphasised it was only by a proper understanding of chemists' needs and difficulties that the design staff could produce balances of the required performance.

Microscope and Diffraction Studies of Soaps

Fresh Light on Modern Problems of Detergency

From A SPECIAL CORRESPONDENT

ELECTRON microscope and X-ray diffraction studies of soaps, carried on recently at the U.S. National Bureau of Standards, have revealed for each type of soap molecule characteristic features that can be used for its identification and analysis. The electron microscope also indicates the individual soap forms that are present in a mixture, such as a commercial soap prepared from mixed fats or oils; this is not always possible with the X-ray spectrometer because of the nature of the diffraction patterns obtained.

Measuring Effectiveness

When considered in conjunction with physico-chemical measurements of aqueous soap solutions, these data offer an explanation of the mechanical process of cleansing, and at the same time suggest a basis for evaluating the cleansing power of the different types of soap.

Although soaps and other kinds of cleaning materials have been in common use for centuries, there are no universally accepted quantitative methods for determining their washing or cleansing power. Extensive data are available in the literature on the structural and phase behaviour of pure alkali soaps in the solid state, as well as on the physico-chemical characteristics of their aqueous solutions.

Soaps and the newer synthetic soapless detergents, however, are in many cases bought only on the basis of appearance and texture; the quantity of suds they produce; and. with some critical purchasers, their action on the skin and hands.

The present investigation was conducted by Gopal S. Hattiangdi, in co-operation with members of the surface chemistry and the constitution and microstructure laboratories at the National Bureau of Standards, to apply some of the newer scientific techniques to the problem.

Commercial soaps contain, for the most part, the sodium or potassium salts of the higher fatty acids. Small amounts of inorganic salts, organic compounds, and other additives may also be present to enhance some special property of the product.

The synthetic detergents, on the other hand, are mostly soapless compounds obtained by the sulphonation, sulphation, or similar treatment of various types of organic molecules.

A total of 30 typical commercial soaps (toilet, medicated, glycerin, coco, washing or laundry, and shaving varieties) and six popular synthetic soapless detergents were included in the investigation. In addition, for the electron microscope and X-ray diffraction studies, a number of pure soaps were prepared directly from their fatty acids.

The differences in structural arrangements between soaps and between soap phases may be determined by examining surface details. Several previous investigators have used the polarising microscope at about 200 to 400 magnifications as a valuable adjunct to visual observations. The electron microscope, with its high resolving power (approx. 100 Å), has been used with considerable success in recent years to examine the surface details and structure of a variety of systems and, in conjunction with the metallic-shadowing technique, yields additional significant information.

The approach to the present study was to obtain first the morphological differences between several pure alkali soaps and then to examine the possibility of characterising commercial soaps on the basis of these observations.

Electron Micrographs

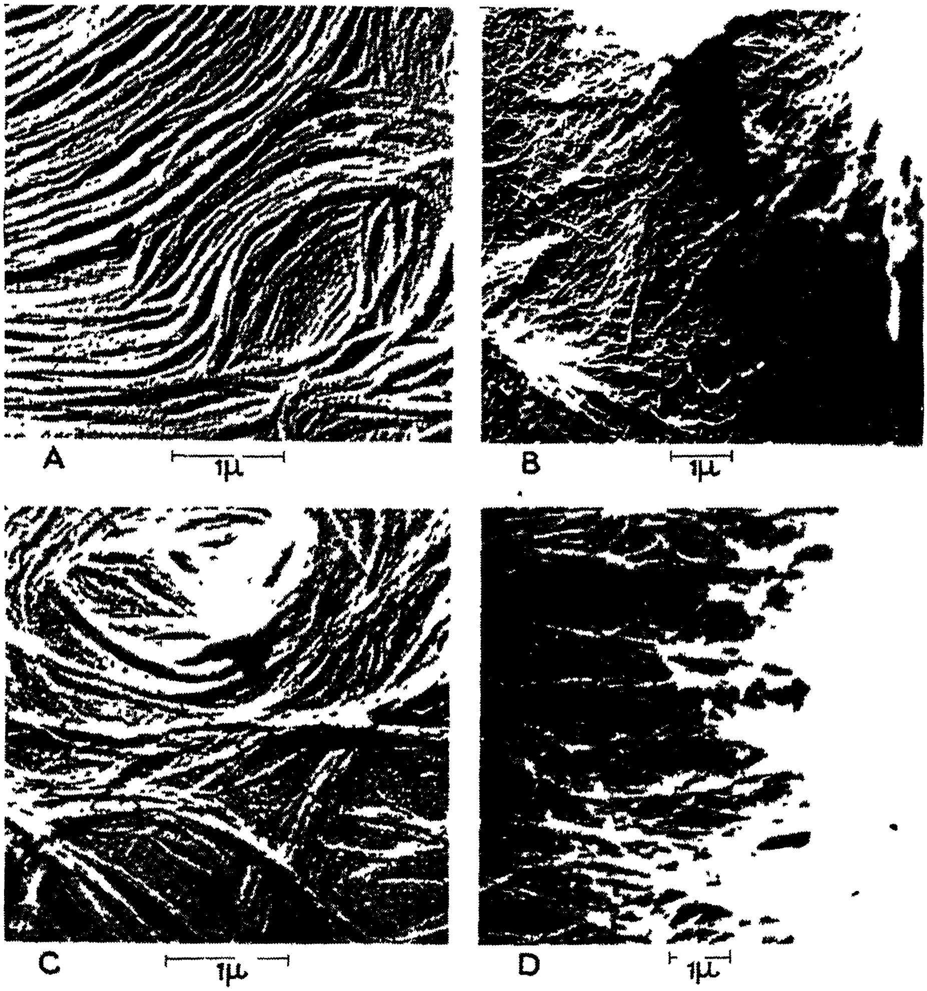
The most characteristic feature of the electron micrographs for the pure soap is an interlocked mesh of fibre bundles of varying diameters and different degrees of twist but with a general tendency toward retaining both a criss-cross and a parallel structure. The diameters of the soap fibres depend upon the nature of the soap, concentration, rate of crystallisation, and other factors. Consequently no measurements and interpretations in terms of absolute units were made.

An attempt has been made, however, to represent schematically the growth of fibres and fibre bundles in terms of molecular packing. Packing of the soap molecules end to end, probably a minimum of ten, determines the "width" of the fibres. The association of the soap molecules in a direction perpendicular to the long axis of the soap molecules, but in the plane of the hydrocarbon chains, takes place almost indefinitely and results in the "length" of the soap fibre.

The "height," or "thickness," of the fibre depends upon the number of soap molecules packed in a direction perpendicular to the plane of the carbon atoms but parallel to the long axis of the soap molecules.

Another outstanding characteristic revealed by the electron microscope is that each pure soap exhibits unique and distinct features, such as a curdy mass, an octopan mass, or filamentous, hairy, frond-like, or sheaf-like formations. These are probably the result of a type of structural unit, such as a micella grouping within the soap fibres,

Whatever the interpretation, these patterns serve as excellent guides for a quick characterisation of the pure alkali and for the identification of the components of commercial soaps of unknown composition. Thus, electron micrographs for the toilet soaps reveal distinct forms for both sodium palmitate and sodium oleate. The shaving soaps are characterised by forms typical of sodium palmitate. The laundry (washing) soaps exhibit forms that cannot be definitely identified with those for any of the



A and B are pure alkali soaps (oleate and palmitate); C and D are their commercial counterparts pure soaps that have been investigated.

X-ray diffraction patterns were also obtained with a Geiger-Müller X-ray spectrometer in order to determine the molecular arrangements or phases present in commercial soaps. When a beam of X-rays is directed at an oblique angle against a soap surface, most of it is reflected at the same angle, but a few rays are diffracted at other angles. The intensity of the diffracted X-ray as a function of the angle at which they occur depends upon the manner in which the soap molecules are arranged. The impulses on the Geiger tube were transmitted to a strip-chart potentiometer so that the desired data were recorded automatically.

A crystalline soap phase, well developed in three dimensions (a, b, and c axes), exhibits a sharp, rather intense long spacing and several short spacings, which are well defined and lead to sharp peaks in the X-ray diffraction pattern. The sharpness of the long and short spacings observed for the various commercial soap patterns therefore indicates that they are all crystalline.

Constituents

X-ray diffraction data have also been used to identify the various phases present in the commercial soaps on the basis of published values of both the long and short spacings for numerous phases of pure sodium laurate, myristate, palmitate, stearate, and oleate. The approximate degree of hydration, based on water (moisture) content, has been computed for the various soaps.

Type of commercial soap	Phases	Degree of hydration
Toilet	Mostly beta sodium palmitate; some omega sodium oleate.	moles of water 0.5 to 1
Medicated	Same as above.	0.5 to 1.
Glycerin	Indefinite.	Indefinite.
Coco	Omega sodium laurate and sodium myristate.	2.
Laundry (washing)	Omega phase ; soap indefinite.	Indefinite.
Shaving	2 or more phases of sodium palmitate.	1.

The X-ray diffraction data can be further used to depict the nature of molecular packing in soap crystals. This may be stated briefly as being an end-to-end packing of the soap molecules, the perpendicular between two consecutive layers of the polar heads (containing the cation) being the observed value of the long spacing.

The distance between hydrocarbon chains of the soap molecules is evidenced as the strong short spacing peak around 4.1 Å. Shorter distances, such as those between carbon atoms in a given soap molecule, may be computed from the values of the relatively weak short spacings exhibited in the region of 2.5 Å.

The packing usually takes place with the soap molecules slightly tilted and the angle of tilt, β, can be determined because the true length of the molecules can be calculated from known values of bond angles, bond distances, and atomic radii. The value of β varies from soap to soap and also from one phase state to another.

Analyses by X-ray diffraction do not always distinguish the components of a binary system because first, a single value of the long spacing may be interpreted as being caused either by a single constituent or by an average of values for two or more distinct forms (two or more separate phases of the same soap or of different soaps); and, second, the short spacing values for two individual soaps or soap phases are unique, but when they are present together the peaks may overlap and their resolution becomes difficult and sometimes questionable. On the other hand, observations by electron microscopy are in excellent agreement with chemical analyses, and in such cases prove to be more rapid and accurate than X-ray diffraction techniques.

As a third phase of this investigation, the physico-chemical properties of solutions of commercial soaps and detergent materials were examined in co-operation with W. W. Walton and J. I. Hoffman for the purpose of interrelating the colloid-chemical nature of the solutions to the phase nature of the solids.

Hence, data were obtained on the electrical conductivity, surface tension, pH, opacity, and rate of growth of foam, of aqueous solutions of numerous soaps and detergent materials. Some qualitative observations were also made on the physical behaviour of the soaps.

Molecular Arrangement

In most cases, there is no great difference in the value of any of the physico-chemical properties for products in any given type of soap as, for example, toilet, coco, or glycerin. X-ray diffraction data and observations by electron microscopy indicate that the molecular arrangements and surface features (phase nature) of these products are very similar.

A correlation between the two thus seems reasonable but has not been attempted quantitatively in the present investigation, mainly for lack of specific details regarding the composition of the products and the various mechanical, thermal, and other treatments received during the manufacturing process.

On plotting the values for each property against the soap content in various solutions, discontinuities are obtained in otherwise smooth and regular curves. The discontinuities occur in two general regions, at approximately 0.1 to 0.2 per cent and 2 to 2.5 per cent of soap. That in the lower concentration is brought about by the formation of a single layer of the soap molecules on the surface, whereas that in the higher region indicates the formation of soap micelles (ionic micelles) with single or multiple charges.

The comparatively steady values of conductivity and surface tension obtained beyond this higher concentration indicate that both the surface and the interior of the system are saturated with respect to the charged micelles.

Constant Values

The synthetic detergents are characterised by their ready solubility in cold water. Solutions of these materials may be either acid or alkaline and have an almost constant value of conductivity and surface tension at high concentrations, and extremely low and constant values of opacity at lower concentrations.

On the basis of colloid-chemical concepts, an efficient cleansing compound should have a low surface tension, a relatively high electrical charge, and ability to form colloidal micelles at low concentration. This facilitates solubilisation.

When the physico-chemical data for solutions of soaps and synthetic detergent materials are considered together, it is seen that greater surface activity and an optimum degree of micelle formation, both in number and in size, are obtained with dilute solutions of synthetic detergents and concentrated solutions of the soaps.

Consequently, cleansing should be achieved better and more economically by using soap solutions of relatively high concentrations and synthetic detergent solutions in the lower concentration region.

SCIENCE LIAISON

Activity of the British Council

SCIENCE received an important share of the attention of the British Council during 1948/49.

Some evidence of this was afforded by the newly issued annual report, which indicates that the science group of departments was re-organised, the engineering and technical side of the science services department being taken over by a combined sciences department. The latter becomes the section for all sciences other than agriculture and medicine.

Widespread reliance on British achievement was reflected in the increasing requests made to the overseas science officers. The Davy Faraday exhibition, for which the council was the British organising body, in Paris in May, was visited by over 100,000 people.

In some countries the council subsidised lecturers whose work accustomed their pupils to the use of British equipment. As a result of a series of I.C.I. films on anaesthesia developments in Britain being shown in Italy, three schools on anaesthesia have been established, based on British practice and using British equipment.

A number of fundamental surveys were made, of scientific achievement in British universities and equivalent institutions and of the financial resources to permit the interchange of British and foreign scientists, promoted by Unesco.

Laboratory Equipment Needed

In a preface to a pamphlet, "Science Laboratories in Need" (HMSO, 9d.), an appeal is made by Dr. Jaime Torres Bodet, director-general of UNESCO, for funds and materials to replace the vast losses through destruction or looting during the war of technical equipment in educational centres in Europe and Asia.

TABLE 2.—PHYSICO-CHEMICAL PROPERTIES OF SOAP SOLUTIONS

Type	Major constituents	Phase	Concentration = 2.5 per cent soap				
			Electrical conductance ohms/c.c. $\times 10^{-4}$	Surface tension dynes/cm.	pH	Opacity Klett scale divisions	Rate of growth of foam. Time in seconds per 100 divided rise
Toilet	Sodium palmitate	Beta	27.24	32.00	10.04	300	19
	Sodium oleate	Omega					
Medicated	Sodium palmitate	Beta	27.39	32.90	10.07	200	23
	Sodium oleate	Omega					
Glycerin	Indefinite		31.06	34.35	10.00	190	19
Coco	Sodium laurate	Omega	27.30	28.45	9.17	2	19
	Sodium myristate	Omega					
Laundry (washing) ...	Indefinite		43.48	33.04	10.16	46	20
Shaving	Sodium palmitate	2 or more	28.12	34.20	10.04	660	30

The Manufacture of Plate and Sheet Glass

Some Recent Technological Advances

SOME of the progress made during recent years in the methods of manufacture of plate and sheet glass was revealed in a paper by Dr. H. Moore, professor of glass technology, University of Sheffield, which he read before a meeting of the Royal Society of Arts. in London, recently, at which Mr. L. H. A. Pilkington, of Pilkington Bros., Ltd., presided.

Developments in plate-glass manufacture during the past 25 years had resulted from three major changes in methods of production, said Dr. Moore. The first step necessary, if any continuous process were to be developed, was to replace the older pot-melting process by another in which the glass would be melted continuously and fed to some machine in which it could be rolled out as a continuous ribbon.

To achieve this, "tank-melting" was adopted. In tank-melting the raw materials were introduced at one end and, as they passed forward, were exposed to flames which raised the temperature to 1500°C. or upwards to 1540°C., so that the raw materials were melted to form glass.

Machinery Advance

While this method of producing the rolled glass was in process of development, a machine was being devised to enable the glass to be ground and polished as a continuous operation. The development of this machine—the continuous grinder and polisher—represented an immense advance in production, associated with a marked improvement in the quality of the finished product. It would not have been unreasonable, therefore, to expect no further developments of importance for some considerable time. In the event, however, the machine was scarcely in operation before preliminary designs were being worked out for one of a still more revolutionary character, namely, the twin grinder and polisher.

In this machine it was proposed to pass the ribbon of glass direct from the annealing lehr to a grinding machine which would operate simultaneously on both surfaces, then to pass it forward to a polishing machine, still as a continuous ribbon, to be polished simultaneously on both sides. This bold conception was, in fact, worked out and the first machine constructed in little more than ten years from the completion of the first continuous grinder and polisher.

There were many difficulties to be overcome. One prime essential was to ensure that the ribbon should not deviate from straightness by more than three or four inches over the whole of its quarter-mile length, which demanded very accurate control of temperature across the annealing lehr in the first place, and precise balancing of the forces exerted by the grinding and polishing heads after the ribbon had entered the machine itself.

It was also necessary to provide means whereby the sand delivered to the grinding runners underneath the ribbon should be distributed evenly across the whole of the under-surface, so as to ensure that the rate of grinding should be the same at all points.

These and many other difficulties connected with the grinding process were rapidly overcome, and at the outbreak of the second world war most of the problems associated with the polishing process had also been solved. The war interrupted the investigation of the remaining problems, but already some hundreds of miles of glass had been produced on the machine, satisfactory in every respect.

Breakages due to minor faults had, however, kept production below the rate for which the machine was designed; and the need for maximum production during the post-war period had further delayed the final perfecting of the twin-polishing process. It was, however, merely a matter of awaiting the time when the necessary equipment could be installed and sufficient staff allocated to the final investigation of the comparatively minor outstanding problems.

Ceramics in Scotland

An expanded market for ceramic chemicals and pigments is anticipated in Scotland as several new ventures in this field develop. Plans are being prepared for an expansion of the industry at Morar, where a successful craft pottery has been launched, also at Kirkcudbright. In addition, the North of Scotland Hydro Electric Board is considering the possibility of assisting in the development of potteries throughout the Highlands as one method of encouraging the use of electricity.

NORWEGIAN PLASTICS & BASIC CHEMICALS

Widespread Expansion of Capacity Since the War

THE belief that there is no basis for the development of a chemical industry in Norway because of the lack of many essential materials such as coal, salt and potash, was disputed with conviction by Mr. Einer Slatto, director in the Norwegian Ministry of Industry, when he addressed a meeting of chemical engineers at Trondheim. Mention was made of the plans for expansion and development under OEEC of the plastics industry.

There was in the Spitzbergen deposits, he said, enough coal to supply the needs of the Norwegian chemical industries for a long time, and sulphuric acid could be made available in adequate quantities and at a reasonable price.

From 300,000 tons of coal, and with a power supply of 100,000-120,000 kW, it should be possible to produce 100,000 tons of petrol, 15,000 tons of methanol (from which formaldehyde can be obtained), 50,000 tons of coal-tar and 250,000 tons of coke. The tar obtained from coking Spitzbergen coal was rich in phenols, and might be suitable for production of materials such as Bakelite.

The Norwegian carbide industry had a capacity of 100,000 tons, but had not come near full utilisation owing to shortage of power. A substantial part of the carbide produced (about 32,000 tons) was used for production of calcium cyanide, the present output of which was 40,000 tons, corresponding to 8000 tons of nitrogen. Present plans envisaged the doubling of this production to 80,000 tons, 18,000 tons of which would be further processed to dicyanodiamide.

Synthetic Resins

Dicyanodiamide would provide a source of melamine, from which excellent thermosetting moulding compounds and synthetic resins were obtained. Difficulty of securing patent rights was, however, likely to be a serious obstacle.

Norway, before the war, imported a substantial part of her requirements of caustic soda and chlorine from Germany. Supply difficulties since the war and the greatly increased demand, particularly for caustic soda, made it necessary to build two new plants for electrolytic production of chlorine. These plants would have an aggregate capacity of 15,000 tons, 50 per cent lye and an equal quantity of chlorine. The present production was 4500 tons. Part of the chlorine produced would go to the woodpulp industry, with a surplus for production of trichloroethylene and polyvinyl chloride.

Phenolic moulding has been in progress in Norway since 1930, states the Norwegian Export Council, and when war broke out there were seven firms engaged in such production. A considerable import trade developed, particularly for moulding materials. Since the war the operating firms had been increased to 12, employing 81 presses capable of providing annually about 500 tons of thermosetting plastics fabrications.

Thermoplastics

There has, in recent years, been a growing interest in injection moulding, with a consequent tendency on the part of firms working with thermosetting plastics to extend their production programmes to thermoplastics.

Import licences for raw materials have, however, been even more difficult to obtain than for thermosetting materials, but some machines have been imported and others built in Norway.

About 60 Norwegian firms are at present working with thermosetting and thermoplastic materials and a substantial number of them are engaged in both types of production. Present capacity, it is thought, should prove sufficient for some time.

Welding has recently been practised with materials such as polyethylene and the harder kinds of polyvinyl chloride. The most popular substances are acrylic materials, particularly of the transparent type.

A factory producing phenolic laminates has a capacity of 500 tons, which should meet the greater part of the domestic demand for electrical insulating boards. The extrusion of tubes, rods and ribbons has been undertaken by three firms, two of which built their own machines.

Shortage of raw materials has been the chief limiting factor in the development of the Norwegian plastics industry. Imports of plastic materials in 1948 had a value of nearly Kr.5 million, of which a little less than half consisted of thermosetting materials, the remainder being made up of thermoplastic powders, sheets, etc. Returns received from 59 out of the

73 existing factories disclose the following imports of raw materials:—

	1948 Consumption	1949 Imports (Planned)	1950 (Planned)
		Tons	
Phenolic materials ...	210	352	540
Urea ,, ...	88	285	475
Melamine ,, ...	4	60	120
Polystyrene ...	137	308	425
Cellulose acetate ...	53	254	329
Polyethylene ...	2	46	123
Nylon	1	5	17
Methacrylate plates	19	114	149
Casein moulding materials	1	9	12
Polyvinyl chloride	61	507	768
Other vinyl moulding materials ...	3	20	39
Other elastomers ...	9	132	265

In view of the present foreign exchange position, the prospect of reaching the 1949 and 1950 targets is, of course, uncertain.

An Elastic Programme

The first of the more ambitious Norwegian projects for production of plastic materials began to take shape in 1946 with the formation of A/S Norske Kunstharpikser. This company, which will produce resins for moulding powders, lacquers and adhesives, is to start operations next year. Its programme is fairly elastic, permitting production to be shifted from one product to another in accordance with the market situation and the supply of raw materials, such as urea and phenol.

During the current year, two firms have started production of phenolic moulding materials using imported resins. One of the firms will base its production on resins supplied by A/S Norske Kunstharpikser as soon as the latter company gets started. These companies—A/S Lilleström Fabrikker and A/S Resin—will have a combined production capacity in excess of present Norwegian requirements.

Norway should be favourably placed for production of cellulose acetate, which A/S Borregaard plans to supply.

Casein plastics offer, *inter alia,* advantages of mechanical strength, easy adaptation to machining, and light and pure colours. A recently established Norwegian firm, A/S Norsk Kunsthorn, of Levanger, makes exclusive use of first-class casein in the manufacture of galalith products. This new factory has powerful financial backing and will produce galalith in the form of plates, rods, tubes, etc. Special colours, or combinations of colours, can be made to order. An exportable surplus from the factory's production should be available from 1950.

Polyvinyl chloride will be produced by A/S Heröya Elektrokjemiske Fabrikker, which is now building a plant expected to reach the production stage in mid-1950. Further enterprises include a plant to be operated next year by A/S Norsk Hydro for the production of urea crystals in sufficient quantity to meet the Scandinavian demand and leave an exportable surplus.

For the further processing of urea into synthetic resins a plant is under construction which will produce formaldehyde with the aid of machinery received from Germany as compensation. The methanol required for this will be imported for the time being.

Although plastics production in Norway is hindered by a number of disadvantages, of which an important one is the lack of benzene, constant research is overcoming some of the major difficulties. Commercial development appears to keep abreast of this work, reports the Export Council.

CEYLON SHARK LIVER OIL

DEVELOPMENT of what may prove a valuable addition to established oil and fat sources, Ceylon's rapidly expanding shark liver oil industry, is indicated by recent successful research in that country.

Malted shark liver oil will soon be obtainable on the Ceylon home and export markets. To cope with the demand for oil of high vitamin content, Dr. S. N. Ganguly, superintendent of the Government factory, recently carried out a preliminary survey, and found that the coast between Jaffna and Trincomalee abounded in fish giving high yields of vitamin oil.

Investigations are now being conducted regarding the possibility of shark fishing by means of trawlers to ensure an adequate and regular supply of raw material for the increasing demands of the factory.

Among the species found locally, one type of oil has a vitamin content of over 80,000 units per gram. Simultaneous laboratory investigations have been carried out for the concentration of low potency oils into high potency oils. It has been possible to produce an oil with a vitamin content of 126,000 units, and the economic possibilities of this process are being further studied.

Samples of high potency oils produced in Ceylon have been sent to concerns in the U.S.A. and the United Kingdom for corroborative tests.

At present the Department of Industries has its own shark liver collecting centres on the coasts of Ceylon.

The Chemist's Bookshelf

INDUSTRIAL HYGIENE AND TOXICOLOGY. Edited by Frank A. Patty. 1949. New York and London: Interscience Publishers. Vol. 2. Pp. xxviii, 535-1138. 90s.

The first volume of this work, prepared by a group of specialists under the editorship of Frank A. Patty, director of the Industrial Hygiene Service, General Motors Corporation, Detroit, was reviewed in THE CHEMICAL AGE in March (*60*, 428). This concluding volume is of equally high standard and as authoritative, and goes minutely into the properties and physiological action of various contaminants of the atmosphere which are likely to be met with in industrial situations. It discusses also permissible concentration, inflammability, odour, and other warning properties. The different classes of contaminants considered, covering a very wide range of over 500 individual chemicals, are grouped conveniently in separate chapters, *i.e.*, under the headings of halogens: alkaline materials, arsenic, phosphorus, etc.; compounds of oxygen, nitrogen and carbon; cyanides; lead; metals other than lead; aliphatic hydrocarbons; aromatic and cyclic hydrocarbons; halogenated hydrocarbons; alcohols, organic acids; esters; aldehydes; ketones; ethers, glycols, etc.; nitro and amino compounds; and phenol and phenolic compounds. All these chapters include numerous tables giving data on physiological response to various concentrations of the chemicals concerned.

The last chapter, however, is by far the most interesting, being devoted to the recognition and control of industrial exposures. It gives significant information about various processes, occupations, and industries which have particular need to safeguard the health of their workers. Here, arranged alphabetically, such subjects are dealt with as abrasive blasting, and acetylene manufacture, meat packing, milling and baking, and less common industrial tasks, as quartz crystal cutting and radium dial painting, stone quarrying and crushing. In this chapter the industrialist, the consultant and the works manager may find valuable reminders—if not, perhaps, entirely new knowledge—for maintaining a greater measure of hygienic safety. For instance, under the heading of "Aniline manufacture, distillation, and handling," we learn that even the small amount of aniline used in some formulæ for waterproof ink has been responsible for poisoning due to skin contact with unlaundered cloth which is stamped with such ink. Aniline, likewise, is also dangerous on shoe soles. These are typical of a number of such pointers to obscure forms of poisoning on which information is not commonly available.—C.H.B.

PAINTS. Selected Government Research Reports (Vol. 2). Ministry of Supply and Technical Information and Documents Unit, Board of Trade. 1949. (HMSO). Pp. 70. 5s. net.

Magnesium alloys are the subject of three out of the eight reports contained in this volume. No. 5 covers a series of sea-water spray corrosion tests made on painted chromate treated magnesium alloys, during which it was found that a series of primers based on vinyl acetate, vinyl chloride, cellosolve methacrylate and butyl methacrylate pigmented with china clay and zinc chrome, while affording excellent protection, were not suitable for general use without modification, as the dry films were soft and wrinkled. In No. 7 the effects of heating on the corrosion resistance of chromate treated and painted magnesium and alloy castings were observed and No. 8 describes tests using the addition of 1/2000 part of phenyl mercury acetate as a fungicide in coat paints.

Other reports covered: the Extraction and Uses of Blood Albumen (No. 1); Viscosity of Paints and Suspensions (No. 2); Temperature Sensitive Paints (No. 3); The Effect of Surface Treatment of Brass and Yellow Metals on the Adhesion of Paint Films, with special reference to the Painting of Optical Equipment (No. 4); and Ground Flax Shives as a substitute for Pigment Dyestuffs (No. 6).

The volume is the first of a series of reports based on scientific and technical research during the war. A wide field will eventually be covered, each volume containing a number of individual reports on one particular subject (THE CHEMICAL AGE, *61*, 734).

Technical Publications

INORGANIC salts, if not removed, may seriously interfere with subsequent chromatographic analysis. After desalting, however, perfect chromatograms can be obtained. An electrolytic desalter forming a compact unit has been designed by the Shandon Scientific Co., London. It can deal with volumes of solutions of the order 1-10 ml., and is especially suitable for use with blood ultra-filtrates or non-protein fractions of tissue fluids. The apparatus can be used to desalt a wide variety of solutions. The ammonium ion, however, if present in considerable concentration, should be first removed by the obvious methods, as the ammonium amalgam formed during the desalting process tends to clog the mercury.

* * *

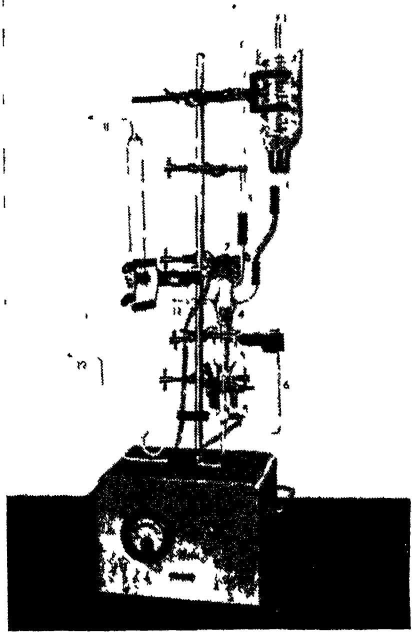
COMBUSTIBLE dusts constitute a special fire hazard in industry, the presence of loose fine material tending to increase the rate of spread of fire in a building, while dust suspensions in the atmosphere may have explosive properties. A survey of "Fires Involving Dusts" has been made by D. J. Rasbash and is now available from the Fire Protection Association as Technical Booklet No. 5. Ninety-one civil fire reports were examined and the more important precautions which should be observed are summarised and indications are given of the problems which still require investigation.

* * *

FISH oils after pressing, "dry-rendering," or solvent extraction, are increasingly used to-day in the manufacture of a variety of products ranging from margarine and cooking fats, sulphated oils for leather tanning, paint and varnish oils and synthetic resins to beauty preparations. In "The Engineering and Complete Fish and Whale Oil Plants" (Bulletin 036) now available from Bamag, Ltd., London, the various processes of extraction, clarification, refining, hydrogenation, etc., are described and illustrated with photographs of plants and flow diagrams. The technology of whale oils, including sperm oil, is also covered.

* * *

THE importance of expert technical assistance on the spot in making a successful entry into new markets overseas under competitive conditions is urged in the latest brochure issued by The Osborne-Peacock Co., Ltd., London. Marketing systems are reviewed.



[Courtesy of the Shandon Scientific Company].

Electrolytic desalter for removal of inorganic salts

GLASS-ENAMELLED steel installations adaptable to all the usual methods of processing chemicals have long proved their value where contact of the chemical product with metals must be avoided. Glass protected reaction vessels, condensers, stuffing boxes and agitators, pipes and fittings that can be assembled into complete glass enamelled installations are described with diagrams and photographs in the latest Pfaudler catalogue (CH.32) and leaflets (IN.31 and PF.28 Rev.) now available from Enamelled Metal Products Corporation (1933), Ltd., London.

* * *

THE Year Book of the Textile Institute, the second issue of which (for 1949-50) is now available, again provides a comprehensive guide to the facilities available to students of textile technology and to the wide range of activities of the Institute. The present issue runs to 258 pages and will be of value to all textile technologists and students. (continued overleaf).

DETAILS of specification, physical constants, general solvent applications and chemical applications, etc., of Shell chemical solvents have been published by Shell Chemicals, Ltd., London, as a series of technical information sheets, bound in convenient loose-leaf form. The present series includes:—Isopropyl ether (218); methyl isobutyl ketone (219); secondary butyl alcohol (220); methyl ethyl ketone (221); diacetone alcohol (222); acetone (223); tertiary butyl alcohol (224); isopropyl alcohol (225); mesityl oxide (228); and methyl isobutyl carbinol (259).

* * *

DIE Deutsche Akademie der Wissenschaften zu Berlin (German Academy of Sciences), Akademie Verlag, Berlin, N.W.7, publishes in small booklets, now appearing in occasional numbers, a series of lectures and dissertations of which the latest include "Floating of DDT in the Nerves of Insects," by Wolfgang Heubner, who established that DDT more intimately affects the nerves than the tissue fluids. "Shaping of the Organisms—a Chemical Problem," by Kurt Noack, describes experimental data showing how certain chemical compounds influence the shaping and organ-formation of plants and animals. "Effective Quantum and Description of Nature," by F. Hund, deals in detail and from some new points of view with Planck's quantum theory.

ION exchange as a means of softening water is the subject of one of the main articles in the "Rohm and Haas Reporter" (Vol. 7, No. 3). Another feature illustrates how Lykopon, the first sodium hydrosulphite manufactured in the U.S.A., and originally used in textile processing and other industrial operations, is now being used as a raw material for the making of pharmaceuticals.

A NEW technique in painting by application of fluorescent pigments as an artistic medium is described in an article by J. L. H. Jonker and S. Gradstein in "Philips Technical Review" (Vol. 11, No. 1). Other articles describe the development of resistance strain gauges and their wide application to engineering problems, and an apparatus for detecting fine cracks on the surface of the wires passing through the bases of electronic valves.

* * *

UNDER the title "£100 per lb.," the Uddeholm Company, Uddeholm, Sweden, has recently issued a small folder, describing its AEB high-carbon stainless steel strip. It is used by scale makers, the dimensions being 3/32 in. by 0.0022 in. Only the very fine material and fine workmanship can achieve such a size—and the price bears this out. The makers believe it to be the most costly form of steel in commercial use.

FILM TRAINING UNDERGROUND

THE appearance of documentary and training films in unexpected places is becoming increasingly common, but this appears to be the first recorded instance of the educational film going underground. This visit to the underworld, 800 ft. down in the Imperial Chemical Industries' anhydrite mine at Billingham, was to show miners the graphic review of safety measures compiled by the Billingham works film unit

PERSONAL

THE University of Birmingham has announced the following appointments. Lectureships: Dr. J. H. Turnbull, chemistry; Dr. W. S. Norman, chemical engineering; F. R. N. Nabarro, metallurgy; Dr. G. F. J. Garlick, physics. Research fellows: K. B. Mather to be I.C.I. research fellow in physics; Dr. D. W. Wakeman to be I.C.I. research fellow in metallurgy.

Presenting the Colwyn Gold Medal for 1949 to Mr. E. A. Murphy, manager of Fort Dunlop general developments division (The Chemical Age, *61*, 683) Mr. Herbert Rogers, the new president of the Institution of the Rubber Industry, described him as the principal " back-room-boy " in the latex field, associated with the Dunlop Company in a series of over 100 latex patents. It was, he said, due to the research of Mr. Murphy and his colleagues that latex was to-day available in bulk supplies and the raw material of a very important section of the rubber industry.

Dr. N. Howell Furman, Russell Wellman Moore Professor of Chemistry in Princeton University, who during the war developed new analytical techniques for America's atomic bomb project, has been chosen president-elect of the American Chemical Society. He will serve in 1951. President for 1950 will be Dr. Ernest H. Volwiler, vice-president of Abbott Laboratories, North Chicago.

As a tribute to his work on behalf of the London Section of the Oil and Colour Chemists' Association over many years, an engraved silver cigarette case was presented to Mr. David E. Roe at a recent ladies' night of the section.

Mr. F. J. Sales has been appointed marketing director of the North-Western Divisional Coal Board, with effect from January 1, 1950, in succession to Col. G. G. H. Bolton, who was recently appointed deputy chairman.

Mr. Robert Buchanan, scientific instrument maker, 75 Robertson Street, Glasgow, left £33,364.

£2200 for Cortisone Research

A grant of £2200, spread over two years, has been made by the Nuffield Foundation to the Royal Technical College, Glasgow, to enable Prof. F. S. Spring, of the Department of Chemistry, to undertake research into cortisone and related compounds. There are several similar grants elsewhere.

NEXT WEEK'S EVENTS

MONDAY, DECEMBER 19.

Institution of Works Managers

Glasgow: 39 Elmbank Crescent, 7 p.m. W. McCorkindale: " Industrial Salvage and Recovery."

Sheffield: Royal Victoria Station Hotel, 7 p.m. L. C. Ord: " Industrial Efficiency."

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, Clerkenwell, E.C.1. Discussion: " Throwing Power "; speakers: G. E. Gardam, J. W. Cuthbertson and S. Wernick.

TUESDAY, DECEMBER 20.

Incorporated Plant Engineers

Glasgow: Engineering Centre, 351 Sauchiehall Street, 7 p.m. J. Barrington Stiles: " Metallising for Industrial Plant Maintenance."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. G. H. Pulfrey: " Progress in Everyman's Transport."

Obituary

The death has occurred at his home, in Balloch, Dumbartonshire, of Mr. Alexander Ross Anderson, engineer and manager of the Vale of Leven area gas undertaking for 12 years. He was 53 years of age and went to the Vale of Leven from Glasgow Corporation 20 years ago as a chemist.

The death occurred suddenly, on December 6 at his home, Brookdale, Dobcross, near Oldham, Lancashire, of Mr. T. P. Ward, managing director of Morton, Son & Ward, Ltd., chemical and general engineers.

The death was reported recently of Mr. Peter Irvine, aged 73, a former Glasgow pharmacist, whose wife, Mrs. Jean Kennedy Irvine, was the first woman president of the Pharmaceutical Society.

Prof. Hubert Kappen, the international authority on agricultural chemistry, has been killed in a motor-car accident while returning home after delivering a lecture at Bonn University. He was 71.

Birmingham Factory Explosion

The cause of an explosion last week at a Birmingham works making aluminium hollow-ware was being investigated by the explosives department of the Birmingham City Police. Widespread damage was caused.

◆ HOME ◆

Christmas Telephone Services

All telephone services to Europe will, the Post Office advises, be open as usual over the Christmas and New Year periods.

Casein Control Ended

The Board of Trade has announced that licences to acquire and dispose of acid or lactic casein will not be required after January 2. (THE CHEMICAL AGE, *61*, 778.)

Shale Oil Centenary

Scottish Oils, Ltd., is to commemorate the 100th anniversary of the Scottish shale oil industry in 1950 with a three-day conference for technicians and experts from the various shale mining and processing countries. Scotland's, is the oldest continuously-operated shale oil industry in the world.

Coal Output

Britain's deep-mined coal production last week brought the year's aggregate output so far to within 10½ million tons of the lowest target figure (202 million tons), with only three weeks to go. Comparative figures are:—Last week: Total 4,598,300 tons (deep-mined 4,378,700 tons, opencast 219,600 tons). Previous week: 4,575,500 tons (deep-mined 4,358,400 tons, opencast 217,100 tons).

Factory Accidents

The possibility that industrial accident prevention work may be neglected in the interest of accelerating output was mentioned by Mr. L. E. Cornford, technical department of I.C.I., Ltd., in his paper on "The Technique of Safety Education," at Scotland's first Industrial Safety Conference in Edinburgh last week. "I think there is this danger," said Mr. Cornford, "because, unfortunately, safety is still considered by many people to be an ancillary service."

More Dollar Exports

An increase of £4.4 million over the October figure in the value of U.K. exports in November is recorded by the provisional figures quoted last week by the Secretary for Overseas Trade. The average monthly value of exports to the U.S.A. in 1948 was $22.2 million, whereas in November 1949, at the considerably lower sterling conversion rate, exports were worth $20.5 million. Exports to all countries in November produced a provisional total of £160.4 million, with a daily rate 9 per cent above that of November last year.

Export Orders

Chamberlain Industries, Ltd., give news of seven recent export orders for cranes and metal working machines of a total value of over £17,000.

Glucose Manufacturers De-licensed

By an amending Order which came into force on December 11, and from that date, manufacturers and wholesalers of glucose will no longer be required to hold a licence.

Workers' Amenities

At the Widnes branch of W. J. Bush & Co., Ltd., chemical manufacturers, three newly completed departments were opened last week. These comprised stores, fire station, and changing rooms, the latter being equipped with clothing lockers and shower baths for the use of the process workers.

Good Demand for Boiler Plant

A high level of demand for boiler plant, at home and in new markets of which Venezuela, Brazil and Peru are noteworthy, is reported by Cochran & Company, Annan, Ltd. The company is reorganising its works, extending the heavy boiler shop and improving the pattern and works maintenance shop.

Record Production of Sodium Cyanide

Workers at the I.C.I. General Chemical Division's Cassel Works, Billingham, who have produced record quantities of sodium cyanide for four successive weeks, were last week entertained by the management to a smoking concert. Congratulating them on their achievement, Mr. W. C. Lyle, works manager, said their production record was helping to increase British earnings from hard currency areas. The Cassel Works is regarded as being the largest European producer of sodium cyanide, which is exported extensively to the gold mining areas of South Africa.

Petrol Indicator Problem Revived

Investigations carried out by fuel officers of petrol in a private pump at Broughton, near Preston, filling station, have revived the problem of analysis results confronting the Ministry of Fuel. The petrol was in fact "white," but reacted to a "red" test due to a stabilising chemical which had been added before it reached England. An analysis was carried out by the Lancashire County Analyst's department and Dr. J. B. Firth of the Home Office Forensic Science Laboratory, Preston, and the findings are being studied.

◆ OVERSEAS ◆

Japan Producing Urea

Production of urea has been started in Sunagawa, Japan, and is yielding about 1000 tons per month.

Methane-Electric Railway Project

The Italian Committee of Reconstruction is studying a scheme to employ methane-driven electric generators in the Valley of the Po to supply some of the power for Italian State Railways. If the research in Lucania brings good results, the scheme will be extended to Southern Italy.

Atomic Research in S. Africa

South Africa may be visited by a party of atomic scientists who will leave the U.S.A. next year to conduct atomic research in agriculture in Africa. This information was given by a Durban research worker who has been asked to make arrangements for the care and shipment of equipment after its arrival in Durban from America, states *Reuter*.

Irish Peppermint

The first two ounces of peppermint oil to be commercially produced in Ireland have been sent to England for analysis. The herbs came from an experimental farm in Leixlip and the oil was distilled in a Government research laboratory. A commercial distillation plant may be built and it is hoped to put two acres of land into peppermint production next year. The yield per acre is 20-30 lb. and the present price for oil from England is from 3s.-5s. per dram.

Plastics in the Argentine

The Argentine Government announced recently that factories processing plastic products, including resins, gums, powders, etc., were considered as of national utility, and that machinery, equipment and essential raw materials required for these industries, and which could not be supplied locally, would therefore be exempt from customs duties. At the same time, the importation of plastic products into Argentina would require special sanction by the Ministry of Industry and Commerce, according to the needs of the market and the output of local industry.

Penicillin Production at Höchst

Reports from Western Germany indicate that large-scale production of penicillin is expected to begin in January next in the Höchst works of the former I.G. Farbenindustrie.

Oxygen for Jugoslavia

A new oxygen plant is to start production soon near Sarajevo, Bosnia, Jugoslavia. It will supply the whole of the Provinces of Bosnia and Herzegovina with compressed oxygen.

Venezuelan Petroleum

Petroleum production in Venezuela has reached an average of 1.4 million barrels per day. Although crude prices are maintained, those of petroleum fell from U.S.$2.50 in 1948 to U.S.$1.15 per barrel in June this year.

Brazilian Chromite

After a considerable decline during the war, Brazil is again exporting chromite, deposits of which exist in the States of Bahia, Minas Gerais, and Goias, those in the first-named being estimated at 140,000 tons.

Italian Refractories

Italy's capacity to produce a vast range of refractory materials, including alumina and silica types, is recognised in a current programme, which in the current year provided for a total output of 200,000 tons of such materials, of which about 76,000 tons are of silica type. It will be necessary to import from Germany about 10.000 tons of siliceous products to supplement local supplies.

U.S. Potash Consumption

Total deliveries of potash salts by U.S. producers during the first nine months of 1949 amounted to 1,663,262 tons, containing 894,982 tons K_2O. Potash for agricultural use in the United States, Canada, Cuba, Puerto Rico, and Hawaii totalled 837,816 tons K_2O contained in 1.570,560 tons of salts. Of this, the chemical industry took 78,613 tons of muriate of potash and sulphate of potash, containing an equivalent of 48.630 tons K_2O.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

GOODALLS (DISINFECTANTS), LTD., Birtley. (M.S., 17/12/49.) Satisfaction November 14, of mortgage registered May 26, 1939.

WIRRAL REFINING CO., LTD., Birmingham. (M.S., 17/12/49.) Satisfaction November 17, of series of debentures registered November 30, 1926.

Increases of Capital

The following increases in capital have been announced:—DIAMOND FERTILISER & CHEMICAL CO., LTD., from £25,000 to £100,000. NORDAC, LTD., from £10,000 to £75,000.

Company News

Mufulira Copper Mines

Production of blister copper by Mufulira Copper Mines in July-September totalled 17,833 long tons. Sales revenue was £2,031,500. The operating expenditure amounted to £900,500, leaving a gross operating surplus of £1,131,000. After allowing for other expenditure and provision for replacements the estimated net profit, before taxation, was £954,500.

Change of Name

The title of Tubes & Fittings (Wholesale), Ltd., producers of special tubular and pipework installations, has been changed to Tubes & Fittings (Bristol), Ltd.

New Registrations

Airkem, Ltd.

Private company. (475,779.) Capital £1500. Manufacturers of chemical preparations of all kinds for reducing odours and for the conditioning and re-conditioning of air, etc. Reg. office: Bilbao House, 36 New Broad Street, E.C.2.

Kamaco, Ltd.

Private company. (475,501) Capital £1000. Manufacturers, etc., of chemical and commercial substances. Directors: M. J. Cockle and H. Kaminski. Reg. office: 122 Clarendon Road, W.11.

F. Duckworth & Co. (Blackburn), Ltd.

Private company. (475,476). Capital £5000. Manufacturing chemists. Directors: F. Duckworth, F. H. Duckworth. Reg. office: 24 Park Road, Blackburn.

Chesterfield Street Laboratories, Ltd.

Private company. (475,750.) Capital £100. Manufacturers of chemical preparations. Solicitors: R. J. Apthorpe-Webb, 19/20 Bolton Street, W.

M.V.A. Laboratories, Ltd.

Private company. (475,713). Capital £5000. Objects: To acquire the business of manufacturers of sulphur products carried on by J. Mitchell-Lewis and E. G. Molyneux, at M.V.A. Laboratories, Lymington Road, Highcliffe, Hants. Directors: J. Mitchell-Lewis, E. E. Young. Solicitors: Mitchell & Ellis, 129 Poole Road, Westbourne, Bournemouth.

Vincent Patents, Ltd.

Private company. (475,392). Capital £2000. Research, experimental, development, designing and chemical engineers, technical consultants, etc. Reg. offices: 6 Wine Office Court, Fleet Street, E.C.4.

Joint Consultation

" THERE is an overwhelming case for the establishment of machinery which provides for full consultation between management and workers, but it is a fallacy to suppose that the workers themselves can participate in actual management. The only effect of such a policy is to turn their accredited representatives in the trade unions into their masters, which leaves the workers without proper representation and fundamentally undermines the position of the trade union leader, who in all these matters has a most vital and responsible part to play." Mr. G. W. Odey, M.P., a member of the Executive Council of the National Union of Manufacturers, at a "Free Enterprise" meeting arranged by the National Union in Manchester last week.

Uraniferous Minerals in Brazil

Reports from Brazil state that an extensive deposit of uranium bearing mineral has recently been discovered at San Jose de Rei, near the British gold mines in Minas Geraes. The deposit is said to extend over six miles, with a thickness varying from 260 to 400 ft.

The Stock and Chemical Markets

STOCK markets have been cheered by the Australian election results, and good rises were scored, notably by Australian bank shares, which showed gains of up to £1. After initial small gains, British Funds, however, became uncertain, and this influenced the industrial and kindred sections, movements on balance having been small and unimportant.

After changing hands up to 43s., Imperial Chemical have eased to 42s. 6d. at the time of writing. Monsanto remained firm at 50s., Boake Roberts were 25s., Albright & Wilson 29s. 9d., and Brotherton at 19s. 3d. Bowman's 4s. shares eased to 5s. 9d. on the lower dividend. Elsewhere, F. W. Berk 2s. 6d. shares were 13s., Pest Control 5s. shares 8s. 6d. and Amber Chemical 2s. shares 4s. 6d. British Chemicals & Biologicals 4½ per cent preference changed hands around 18s. 6d., Fisons were 27s. 6d., and Laporte Chemicals 5s. ordinary at 9s. 7½d.

Lever & Unilever remained more active around 44s. and Lever N.V. were 44s. 1½d. Borax Consolidated deferred were again firm at 57s. 9d. and Glaxo Laboratories have been up to £22. Triplex Glass held their improvement to 18s., United Molasses showed activity at slightly over 39s. and British Glues & Chemicals 4s. ordinary became firmer at 18s. 9d. Dunlop Rubber at 61s. 9d. failed to hold best levels and shares of companies connected with plastics remained uncertain with British Xylonite at 60s., British Industrial Plastics 2s. shares 4s. 9d., De La Rue 23s. and Kleemann 8s. 6d.

Elsewhere, General Refractories firmed up to 22s. 9d. and Turner & Newall remained at 75s. On the other hand, British Aluminium (41s.) have so far failed to recover from their recent small reaction, and British Oxygen were 90s. 3d.

Associated Cement at 76s. 9d. showed maintained firmness on general confidence that prospects of the dividend rate being repeated for the current year are good, particularly in view of further growth in export business. Tunnel Cement at 45s. and Rugby Cement at 16s. 1½d. have been active at slightly higher levels and British Plaster Board 5s. ordinary were also higher at 13s. 6d.

Movements in iron and steels were moderate, although Dorman Long were good at 31s. 3d., United Steel strengthened to 28s., Guest Keen to 41s. 1½d. and Ruston & Hornsby to 27s. 6d. Courtaulds (34s.) and British Celanese (18s. 9d.) remained firm. Boots Drug at 50s. 3d. have moved in favour of holders. Griffiths Hughes were 21s. 4½d., Beechams deferred 14s. 9d. and Sangers 22s. 9d., while the 4s. units of the Distillers Co. fluctuated between 17s. 9d. and 18s. 3d.

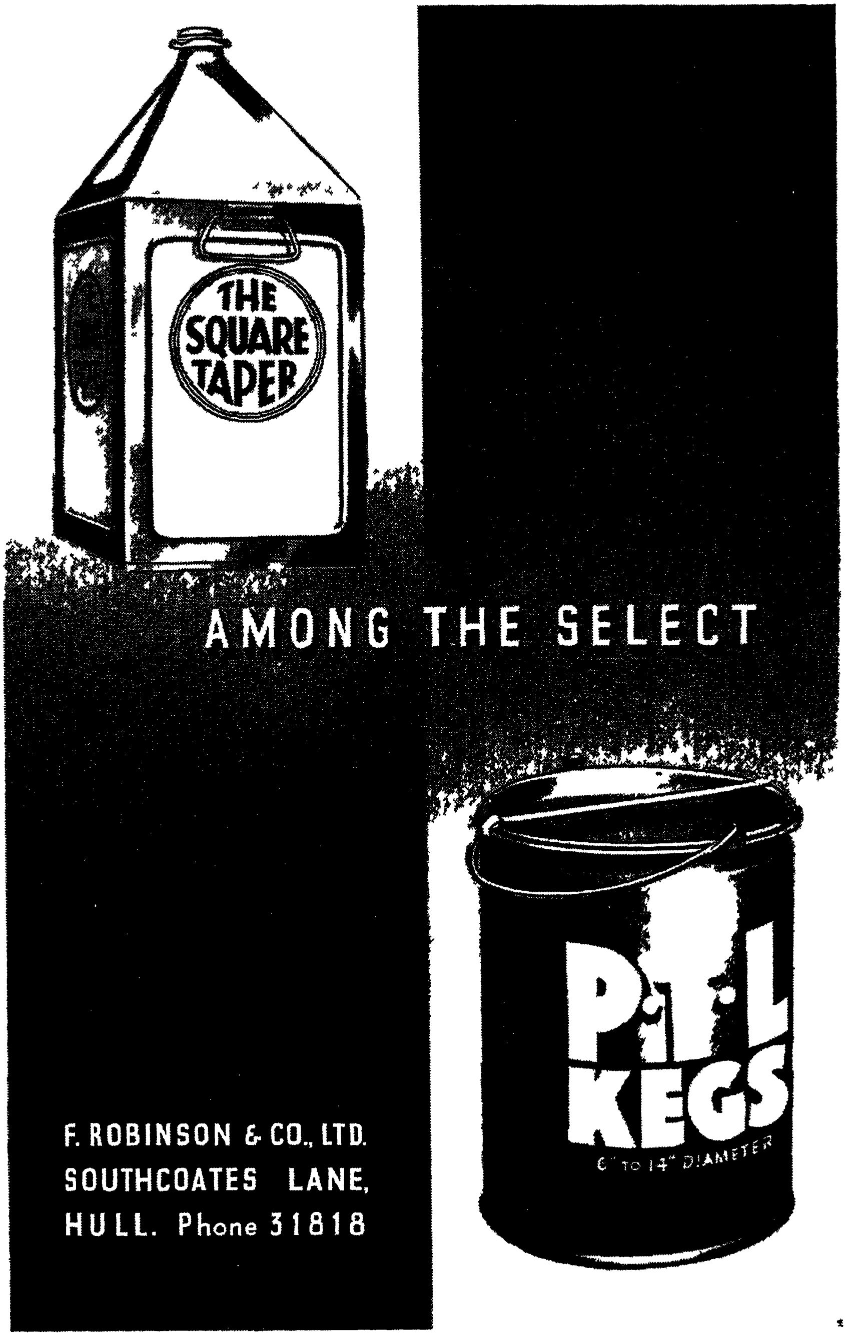
Oils failed to hold earlier gains, being affected by Sir S. Cripps' request for economy. Shell, however, were slightly higher on balance at 68s. 1½d. and Anglo-Iranian were close to £7.

Market Reports

ACTIVE conditions continue in evidence in almost all sections of the industrial chemical markets, the price position being unchanged and firm. Delivery specifications against contracts have been well up to schedule and buyers for the chief consuming industries are becoming increasingly interested in contract replacements. On the export side inquiries continue to be fairly numerous and the aggregate volume of overseas trade in chemicals, dyestuffs and pharmaceuticals is being maintained at a high level. A steady trade is reported in the coal tar products and supplies generally are sufficient to meet immediate needs. The xylol position is an outstanding exception, the demand being greater than available supplies. Pitch continues in good request both for home and export.

MANCHESTER.—Traders on the Manchester chemical market during the past week have reported that quantities of the alkali products and other leading heavy chemicals have formed a steady supply against existing commitments, although, as is usual at this time of the year, there has not been quite the same pressure as regards new business. Exporters' inquiries have been fairly numerous. Except in one or two sections, trading conditions for fertiliser materials have been quiet. There has been a steady trade in most of the tar products, especially in the light distillates.

GLASGOW.—Turnover in the Scottish chemical market has been on a slightly increased scale, which may evidence a general feeling that many prices will increase in the New Year, particularly in view of the anticipated increase in rail rates. The supply position, however, has been well maintained and, apart from xylol, no particular shortages have been noted. The xylol position continues to be very difficult.



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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Manufacture of steel.—Soc. d'Electrochimie, d'Electro-Metallurgie et des Acières Electriques d'Ugine. Nov. 17 1938. 631,235.

Process of making compositions and composite materials.—A. M. Monath. June 18 1945. 631,097.

Device for dispensing liquids.—Dole Valve Co.—Feb. 2 1945. 631,170.

Sludge tanks for reconditioning coolant liquid.—H. W. Hapman. April 23 1946. 630,963.

Process for obtaining by galvanic means a coating for protecting magnesium from corrosion.—H. M. Freud. July 26 1945. 631,237.

Method of making an artificial thermosetting resin and the resin resulting therefrom.—Quaker Oats Co. July 9 1945. 631,109.

Method for the preparation of nuclear substituted quinoline compounds and intermediates therefore.—H. R. Snyder, and R. E. Jones. June 4 1945. 631,110.

Preparation of compounds of the cyclopentanodimethyl - polyhydrophenanthrene series.—Merck & Co., Inc. July 14 1945. 631,238.

Gaseous fuel.—S. H. White. July 30 1946. 631,173.

Automatic flow regulating valves.—R. Shields. (Vickers, Inc.). Aug. 13 1946. 630,968.

Making of starch derivatives.—H. J. Fitzpatrick. (National Starch Products, Inc.). Aug. 29, 1946. 631.242.

Device for producing toxic vapours.—I.C.I., Ltd. Sept. 11 1945. 631,113.

Fumigating compositions.—I.C.I., Ltd., J. Taylor, J. M. Holm, and A. C. Hutchison. Sept. 18 1946. 631,114.

Coating compositions.—J. O. Farrer. (Continental Can Co., Inc.). Oct. 4 1946. 631,245.

Polymers and copolymers of fumaric acid diesters.—J. C. Arnold. (Standard Oil Development Co.). Nov. 5 1946. 631,117.

Recovery of salts from dilute solution.—Permutit Co., Ltd., and W. G. Prescott. Nov. 14 1946. 630,979.

Process for the manufacture of suspensions of phenols.—Pest Control, Ltd., and F. R. Eirich. Dec. 2 1946. 631,120.

Process of preparing oxazolone compounds. Merck & Co., Inc. Dec. 21 1945. 631,191.

Methine dye intermediates.—General Aniline & Film Corporation.—Dec. 29 1945. 631,124.

Process for the production of penicillin.—Merck & Co., Inc. Jan. 22 1946. 631,126.

Liquefied gas pumping systems.—W. A. Wildhack. Feb. 15 1946. 631,196.

Treatment of the surfaces of constructional and other materials.—Latik (London), Ltd., and A. E. Comisso. Feb. 13 1942. 630,990.

Utilisation of fuel gas containing low purity hydrogen in the catalytic refining of petroleum hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Feb. 14 1947. 631,258.

Method of preparing linear polyesters.—Wingfoot Corporation. July 16 1946. 630,992.

Condensation products of ureides and formaldehyde.—Geigy Co., Ltd., H. Jones, and J. K. Aiken. Feb. 24 1947. 631,200.

Manufacture of thick foils of regenerated cellulose and cellulose derivatives.—Kooperativa Forbundet Forening U.P.A. May 10 1946. 631,260.

Manufacture of disazo-dyestuffs.—Ciba, Ltd. April 11 1946. 631,262.

Process for the production of organic carboxylic acid anhydrides.—E. I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. April 2 1947. 631,001.

Production of compounds of alginic acid and its derivatives.—Alginate Industries, Ltd., J. B. Speakman, N. H. Chamberlain, and C. M. C. Dorkin. April 2 1947. 631,002.

Pyrazole compounds.—E. I. Du Pont de Nemours & Co. May 3 1946. 631,269.

Stabilised synthetic polymers.—British Thomson-Houston Co., Ltd. May 13 1946. 631,006.

Drying phthalocyanine pigments.—General Aniline & Film Corporation. July 12 1946. 631,138.

Drying phthalocyanine pigments.—General Aniline & Film Corporation. July 12 1946. 631,139.

Production of monocyclic aromatic tricarbonimides and related compounds.—I.C.I., Ltd., J. Munro, and J. E. Gill. May 23 1947. 631,007.

Production of monocyclic aromatic triisocyanates.—I.C.I., Ltd., J. Munro, and J. E. Gill. May 23 1947. 631,025.

Recovery of polymeric materials.—Standard Oil Development Co. Aug. 23 1946. 631,272.

Chlorination of phthalic anhydride.—Niagara Alkali Co. Feb. 22 1944. 631,008.

Jets for the atomisation of fuel oils or the like.—B. H. Schieldrop. June 27 1947. 631,212.

Vat dyestuffs of the anthraquinone series.—I.C.I., Ltd., and A. Livingston. June 30 1947. 631,213.

Organo - dihalogenosiloxanes. — British Thomson-Houston Co., Ltd. Oct. 29 1942. 631,018.

Polyamides and processes for their production.—British Celanese, Ltd. Aug. 30 1946. 631,020.

Manufacture of dyestuffs of the xanthene series.—I.C.I., Ltd., and H France. July 16 1947. 631,040.

Manufacture of organo silicon-alcohols. —J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 631,049.

Manufacture of solutions of polyvinyl derivatives.—Soc. Rhodiaceta. Oct. 1 1946. 631,055.

Manufacture of thymoxyacetamidines. —Ciba, Ltd. Sept. 9 1946. 631,057.

Method and apparatus for fibreising molten material.—A. H. Stevens. (Johns-Manville Corporation). Sept. 23 1947. 631,061.

Manufacture of pyridyl-3-carbinol and process for obtaining same.—Roche Products, Ltd., and A. Cohen. Oct. 28 1947. 631,078.

Processes for the polymerisation of ethylenically unsaturated compounds.—E. I. Du Pont de Nemours & Co. Oct. 30 1946. 631,225.

Atomising nozzles.—Westinghouse Electric International Co. Nov. 15 1946. 631,082.

Means for freeing from dust and cleaning filtering or non-filtering walls or the like.—E. Damond. July 27 1937. 631,586.

Production of cyclohexane.—Anglo-Iranian Oil Co., Ltd., S. F. Birch, J. Habeshaw, and C. B. Collis. Oct. 19 1945. 631,309.

Apparatus for determining the Mach number in a stream of fluid.—Power Jets (Research and Development), Ltd., and R. P. Probert. March 19 1946. 631,453.

Nitric Oxide

The patent number of the specification under the name Wisconsin Alumni Research Foundation, referring to the production of nitric oxide, was incorrectly given last week. The number should read 630,715.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

THE **CIVIL SERVICE COMMISSIONERS** invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER,** to be filled by competitive interview during 1950. Interviews will begin in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science. Candidates must have obtained a University Degree in a Scientific subject (including Engineering) or in Mathematics with First- or Second-Class Honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer posts taking their degrees in 1950 may be admitted to compete before the result of their degree examination is known.

Age Limits.—For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1950; for Scientific Officers, at least 21 and under 28 (or under 31 for established Civil Servants of the Experimental Officer Class) on 1st August, 1950. Salary scales for men in London: Senior Scientific Officers, £700 × 25—£900; Scientific Officers, £400 × 25—£650. Rates for women are somewhat lower.

Further particulars from the Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1, quoting No. 2887.

4993/200.

SITUATIONS VACANT

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Chemical Engineering Research

WHILE the chemical engineer is in the fortunate position of being able to take advantage of the results of researches in the pure sciences and of complimentary developments in mechanical, civil and electrical engineering, he is nevertheless handicapped by the very limited amount of original work going on in his own particular field. Much of the delay in applying to industrial uses the results of new scientific discoveries, to which Sir Henry Tizard and others have recently drawn attention, is, in fact, due quite as much to the want of adequate facilities for this kind of development as to the lack of qualified people to undertake it. With the inauguration of undergraduate and post-graduate courses in chemical engineering at some universities, the building up of schools of research in this subject has now become possible; and, provided a close and effective collaboration between the universities and industry can be established, an important step will have been taken to close the gap which at present exists between the laboratory and the works.

In promoting the systematic training of chemical engineers and in providing in its *Transactions* a forum for the discussion of subjects of interest to chemical engineers in general, the Institution of Chemical Engineers is supplementing the efforts of the universities and is ensuring the maintenance of a high standard of professional qualification among its members. That service is preserving and enlarging the ideals of the founders, the group of eminent chemical engineers, among whom was the late Professor W. Hinchley, who were brought together during the 1914-18 war. Professor Hinchley was also responsible for establishing the first post-graduate course of chemical engineering at the Imperial College of Science in 1921 and some 15 years later his successor, Professor S. Ure, was instrumental in organising the first undergraduate course leading to the degree of B.Sc. (Eng.) in Chemical Engineering at London University. Other universities have since established similar courses—notably Birmingham under Professor Garner, Leeds under Professor Roberts and Cambridge under Professor Fox.

The setting up of these schools was a most welcome recognition, if overdue, of the important role of the chemical engineer in industry. The economic situation of the country is admitted to

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require among the prime essentials for recovery all possible additions to industrial efficiency and the introduction of new techniques and new products. Industry requires a steady influx of highly trained technologists and engineers, and it is principally to the universities that it looks to meet the demand.

We have recently had the opportunity of discussing with Professor Newitt, Courtaulds Professor of Chemical Engineering at the Imperial College, the provision for training there. The college, as has been mentioned, offers a 4-year undergraduate course in chemical engineering and a two-year post-graduate diploma course for graduates in chemistry, physics or engineering. The two systems of training produce men of rather different qualifications, although both find places in industry and both have the fundamental scientific background which, combined with practical experience, produces a fully qualified chemical engineer. Professor Newitt stressed the importance of establishing, in parallel with the formal instructional courses, schools of research in which post-graduate students can receive training in the methods of research by investigating on a pilot plant scale fundamental problems concerned with the design of plant and the operation of basic processes.

He has some fifteen research students working at the Imperial College of Science on such problems as heat transfer at low temperatures, the mechanism of the drying of solids, pneumatic and hydraulic conveying of solids, mixing and agitating and distillation. In connection with this work, he is endeavouring to collaborate as far as possible with industry to ensure that students are brought as early as possible into contact with the practical side of their problem. This he regards as an essential part of the students' training and also as offering benefits to industry, inasmuch as it enables the practising chemical engineer to keep in touch with the universities.

All these measures, excellent as they are, obviously must be regarded only as the prototypes of the much more ample programme which will be required if chemical engineers are to be provided in the numbers, and with the attainments, which the present evolutionary stage of chemical-cum-physical science so urgently requires.

Notes and Comments

Instruments and Chemicals

THE knowledge that practical advances in chemical industries often depend for their usefulness upon the enterprise of the instrument makers finds probably its best expression in the U.S.A., where the 22nd Exposition of Chemical Industries is reported to have represented in its instruments sections an innovating spirit matching anything the producers of chemical products and intermediates could show. It has been estimated that of all the new items assembled in New York more than one-quarter were in the instruments category. While the close integration of makers and users of instruments which has permitted the former to anticipate industries' needs of such things as radioactivity recorders is certainly not confined to the U.S.A., it seems evident that it has reached a much more advanced stage there than it has anywhere else. That is undoubtedly one of the prime factors which have given the U.S.A. its unmistakable lead in the production on commercial scale of some new industrial materials which might otherwise have remained merely laboratory curiosities. The fruits of that seem to have had ample evidence in New York. The result cannot be dissociated from the fact that the making of recording and monitoring devices has become one of the most remunerative of American specialist industries, and so is able to carry research staffs fitted to provide rapid answers to the kind of problems encountered in enterprises such as the economical synthesis of desoxycholic acid (for cortisone) and the workshop use of beta-ray emission. It is worth noting, as another example of the integration doctrine flourishing in spite of the keenest sort of competition, that during the exposition more than 50 films were shown, many of them unreservedly recording complete chemical operations or special processes in commercial use.

Looking Ahead

WHERE would the steel technologists, the chemists and a host of others come from were anything to divert the self-renewing stream of unpaid private enterprise, which has been carrying on with all the tools which science has afforded the traditions of the antique crafts and guilds? The problem, fortunately, is a hypothetical one, because all the evidence points just now to the existence of a keener and more practical appreciation of the need to catch—and train—the young intake in numbers large enough to maintain all the objectives which research and development have captured. Training the surplus of specialists who must take the next objectives, if there are to be any, is less easily assured. Such reflections are brought to mind by, among other things, the modern activities of the iron and steel industry, which has never permitted the knowledge that it is supposed in the near future to become a Whitehall department to frustrate its recruitment programmes, represented by the British Iron and Steel Federation's Recruitment and Training Committee and other far-sighted schemes of the same kind. The enterprise of that committee is manifested by the variety of means it employs to implant the right ideas in soil in which more advanced ones may be expected one day to germinate—by exhibitions, film shows, training schemes and exchange visits overseas for young steel workers. Something of this was revealed at the recent steel industries' conference at Ashorne Hill by Mr. Gerald Steel (United Steel Companies, Ltd.), who emphasised the responsibility of management to ensure that talent is secured and encouraged wherever it is found.

Careers for Chemists

THE steel industry is fortunately not alone in its concern for this precious addition to the country's real assets. The same missionary spirit animates the groups within the Royal Institute of Chemistry which are now spending evenings in various parts of the country telling children and students about "Careers for Chemists." They are bringing to that far from simple task what appears to be a rare combination of realism—represented by rewards, advancement and material prospects in general—and of idealism sufficient to make it clear the profession of chemistry is not "just a job."

Transatlantic Spelling

SPELLING has always been something of a problem in chemistry, especially in its international aspects, and in recent years there has been a noticeable infiltration of American style into papers published in English, occasionally in this country, but more particularly in translations from abroad, and not necessarily from the U.S.A. The latest move in this trend to change our familiar spelling is the reiterated recommendation of the American Society for Testing Materials and the Institute of Petroleum to spell the word kerosene with "ine" and not "ene", a standardisation which they attempted to enforce nearly 25 years ago. The relative antiquity of the argument does not seem to provide any good argument why we should succumb to American influence. Equally, it may be asked, is it to be sulphur or "sulfur"? Aluminium or "aluminum"? There is, of course, a host of similar examples in which we agree to differ. If a uniform spelling is desirable between the English-speaking (and writing) nations, an equally good case could be made for the retention of the style which was familiar to all long before North America had any interest in kerosene or sulphur and the rest. It remains only for some disgruntled party to remit the dispute to UNO—when Britain would have good grounds for adopting the familiar Soviet technique of applying the veto!

A Wish for Christmas

THE CHEMICAL AGE, hastening to press with the prospect of four days' cessation of all publishing problems, wishes readers a happy and tranquil Christmas, far removed from all preoccupations with processing—other than those associated with the heat treatment of turkeys and the subsequent exercises in domestic detergency.

A New Source of Bitumen for Europe

BULK shipment of bitumen from Curacao, in the Netherlands West Indies, to Denmark and Portugal has been planned by the Shell organisation and it is hoped to satisfy by the extension of this scheme about 60 per cent of Western Europe's demand. Expansion of road construction activities and a revival of industrial building are expected to account for a considerable increase in consumption generally.

Construction of the necessary bulk receiving depots has already begun for Shell in Denmark, at Copenhagen, and in Portugal, at Setubal, near Lisbon. At these 6000-ton storage depots, each of which will cost about £120,000, the bitumen, which is to be shipped in two basic grades, will be manufactured into a wide range of products.

To overcome the problem of transatlantic shipment of "hot" bulk bitumen, Shell has converted three 9000 d.w.t. tankers at a cost of £30,000 each, in which the centre tanks, with a capacity of about 4500 tons, have been specially equipped with coils and fitted with jacketed lines and pumps. The balance of the cargo in the wing tanks will consist of black oils.

Previously, in Europe, bulk shipment has been confined mainly to haulage of locally manufactured bitumen by small carriers of 2000-2500 tons, which now operate mainly between France and the North African coast. Modernisation of the French bitumen fleet is, however, contemplated and plans include two 3000 d.w.t. special bitumen carriers, expected to be in service by 1952.

Under the existing system of distribution in Europe the product has been supplied both in drums and in bulk. Drums are necessary because some grades cannot be economically transported in bulk, but bulk purchase eliminates the cost of the containers. The product is also easier to handle since decanting and re-heating are unnecessary.

CIBA AND M. & B. APPEAL

House of Lords Reserves Judgment

AFTER a hearing lasting three weeks, the House of Lords on Thursday last week reserved judgment in an appeal by May & Baker, Ltd., of Dagenham, and Ciba, Ltd. (formerly the Society of Chemical Industry in Basle) in connection with letters patent granted for the manufacture of new benzene sulphonamide derivatives. The appeal was against an order of the Court of Appeal affirming a decision of Mr. Justice Jenkins, refusing a motion for leave to amend the specification of the patent by limiting it to sulphathiazole and sulphamethyl-thiazole. The motion had been opposed by Boots Pure Drug Co., Ltd., whose petition for revocation of the patent was granted by Mr. Justice Jenkins.

Sulphathiazole

Mr. Basil Drewe, K.C., for the appellants, explained that the proceedings concerned a patent originally applied for in Switzerland by Ciba but subsequently granted jointly to them and to May & Baker. The lower courts held that the proposed amendment would make the specification claim an invention that was substantially different from that claimed in the unamended specification. His contention was that that was not so, since the specification, whether amended or unamended, was founded on the same inventive step—namely, the therapeutic value to be derived from the incorporation of the thiazole group in the sulphonamide molecule.

"New Invention"

Mr. Lionel Heald, K.C., for Boots, said the invention published by Ciba was not a chemo-therapeutic invention but merely a claim to a very large body of entirely new chemical substances, with an instruction as to how they could be made. Although the appellants sought to cut out the broad claim of their original invention, they were not cutting out the broad statement and leaving a narrower statement as one might expect but were completely altering the statement. That, he submitted was a considerable step towards having a new invention.

[The original Letters Patent (No. 533,495), with which the long-drawn out legislation is concerned, was based upon recognition of the great therapeutic properties of sulphathiazole. The claim, however, related to several different processes and embraced a product claim for "benzene-sulphonamide-thiazole derivatives whenever prepared or produced by the manufacture particularly described and ascertained herein or by any process which is an obvious chemical equivalent thereof."

(*continued at foot of next column*)

The "substituent capable of conversion into an amino group" used in the preceding claims referred to acylamino, nitro, nitroso, azo or hydrazo group or a halogen atom. According to Boots Pure Drug Company, at the original hearing, the claims in this patent might afford protection to approximately 97 million compounds.]

FLUORINE CASE REOPENED

Aluminium Company in Court

THE legal proceedings based on the complaint of the petitioners, Ben Nevis Distillery Company (Fort William), Ltd., and its managing director, Joseph William Hobbs (THE CHEMICAL AGE, *59*, 778, 847; *60*, 250, 251, 431) that fumes from the large plant of the North British Aluminium Company were causing serious harm to animal and vegetable life were revived at the Court of Session, Edinburgh, on December 15.

Counsel for the petitioners alleged that the aluminium company was not fulfilling its undertaking—to make remedial alterations with all possible expedition—and urged that it had forfeited any claims to indulgence. It was "pathetic" he said that this "enormous firm" had managed to produce only 18 new furnaces in a year when it had to reconstruct 184.

Eighteen New Furnaces

Officials of the aluminium company were doing everything to improve the position by the speediest possible installation of new furnaces, claimed Mr. W. R. Milligan, representing the aluminium company. It was emphatically denied that remedial measures could be considerably hastened. There were supply, labour, and time difficulties; but by July 18 furnaces of a new type were in operation and a further 32 old furnaces had been dismantled.

On the ground that the Ministry had not complied with legal procedure in the process of the case, Mr. W. Grant, who sought to intervene on the instructions of the Ministry of Supply, was refused permission to speak on the dispute. Lord Birnam reserved judgment in the case, and allowed Mr. Grant a week in which to lodge representations on behalf of the Ministry.

Fewer Import Restrictions

Further Relaxations Announced

IN accordance with the agreement with the OEEC for the liberalisation of trade, the removal of import licensing restrictions from a further wide range of goods was announced last week.

The new relaxations, with certain exceptions, become effective from January 5, 1950, and will apply as in the case of the previous announcements to goods imported from any country other than:—

The U.S.A., Canada, the Philippines, the dollar account countries of Central and South America (Bolivia, Colombia, Costa Rica, Cuba, Honduras, Mexico, Nicaragua, Panama, Venezuela), Argentina, Uruguay, Japan, Iran, Tangier, the French Somali Coast, Liberia, the U.S.S.R., Rumania, Bulgaria, Hungary, Czechoslovakia, Poland, the Russian Zone of Germany, Jugoslavia, Albania, Belgium, Belgian Congo, Luxembourg, Switzerland, Western Germany.

These further relaxations help to discharge the Government's obligations under the OEEC decision of November 2.

Chemical Materials

For foodstuffs, the existing relaxations already account for 83 per cent. In the manufactured goods group the relaxations will now extend to something over 50 per cent of imports in 1948 from all the participating countries. In the raw materials group the relaxations will now extend to some 68 per cent.

The official list of materials. etc., to be freed from import restrictions includes these:—

Group 2 (Mineral Products and Metals).—Abrasives: Aluminous oxide (fused), corundum (natural), diamantine powders, emery, garnet concentrates and grain, microdol (micronised dolomite), pouncing flints, being crushed and graded quartz, pumice, shot and grit of iron or steel, silicon carbide, Tripoli powders, Vienna lime.

Aluminium and aluminium alloy ingots (secondary), containing more than 50 per cent by weight of aluminium, asbestos manufactures, asphalt and bitumen (natural), brass, bronze (including aluminium bronze) and gunmetal in the form of ingots (50 per cent or more of copper), building bricks and hollow blocks manufactured from clay, cement (calcareous), coal-tar and coal-tar pitch, corhart bricks and blocks.

Ferro-alloys of aluminium, beryllium, boron, carbon titanium, cerium, cobalt, copper, manganese, molybdenum, nickel, phosphorus, selenium, sulphide, titanium, tungsten, vanadium, zirconium (more than 10 per cent of zirconium).

Manufactures wholly or mainly of non-ferrous metals and their alloys (excluding uranium, precious and rare earth metals): Wrought bars, rods, shapes, sections and wire; wrought plates, sheets and strip exceeding 0.006 in. in thickness; tubes, pipes and hollow bars of all sections.

Metals: Antimony, calcium, cobalt compounds, manganese, molybdenum, tungsten, vanadium, molybdenum powder, Mullite (calcined kyanite or cyanite).

Ores and concentrates of beryllium, bog ore, cobalt, iron, manganese, tin, zinc.

Quartz, raw rock crystals and slabs, not processed; refractory or heat insulating bricks and blocks; scrap metals, residues and wastes fit only for the recovery of metal (excluding scrap containing precious metal); silica sand, tungsten powder.

Group 3 (Oils, Waxes, etc.).—Gums and resins: Dragon's blood, gamboge, locust bean, shiraz, oiticica oil (raw), resin (colophony), rosin (hydrogenated or polymerised), turpentine.

Group 5 (Chemicals, Drugs, Medicines, etc.).—Abietic acid, barium chloride, bicarbonate of soda, borax, boric acid, caustic soda, charcoal (other than activated or decolorising), inks, iron oxide (natural), lamp black, locust bean kernels, paints, painters' enamels, lacquers and varnishes, including pearl essence, potassium carbonate. soda ash, sodium chlorate, tannic acid, ultramarine blue, zirconium oxide (natural).

Group 8 (Gas and Chemical Plant).

Group 16 (Tanning Materials).

Token Imports in 1950

THE Board of Trade has announced that it has been decided to continue the Token Import Scheme in 1950 on the same basis as in 1949. The annual quota will remain 20 per cent by value of each individual manufacturers's average trade in the commodity with the United Kingdom in 1936-38. Participants are Australia, Belgium and Luxembourg, Canada, Denmark, Finland, France, Holland, India, Norway, Pakistan, Sweden, Switzerland and the U.S.A.

The consolidated list includes paints and varnishes, bone black, porcelain enamel frit, medicinal preparations for retail sale under proprietary or trade names, and meta fuel; petroleum jelly preparations, shampoos and laundry soap.

Anglo-Swedish Talks in 1950

ANGLO-SWEDISH trade discussions were concluded in London last week after a review of the probable trend of trade and payments for 1950.

The United Kingdom is again to import timber, pulp, paper, and iron ore from Sweden, as well as various manufactured goods and machinery. Swedish exports to the United Kingdom in 1950 may be worth about £60 million.

The Swedish import programme will also cover a wide range of U.K. products, including chemicals (£6 million). It is hoped that U.K. exports will reach a value of at least £73 million for the year. The issue of import licences will commence as soon as possible.

AMMONIA FOR RESEARCH

Study of Energy Levels

THE increasing importance of ammonia in the scientific world as a precision research tool is pointed out by Dr. W. D. Hershberger, of the department of engineering, University of California, Los Angeles, U.S.A. The first important practical application was the atomic clock (THE CHEMICAL AGE, *60*, 189), whose principles Dr. Hershberger helped to develop while he was a member of the research laboratories of the Radio Corporation of America.

The atomic clock's accuracy (it loses no more than three seconds a year) is due to a stabilising device employing ammonia gas and a microwave generator. This same stabilisation effect may be utilised, states Dr. Hershberger, under field conditions for calibration of delicate radar instruments.

The absorption of microwaves by the ammonia molecule is also proving to be an excellent research tool for structural chemists. It is particularly valuable in studying extremely small differences between energy levels in molecules, atoms, or nuclei and the life time of excited molecular states. Such a tool also should find application in studies on chemical reaction rate in gases, Dr. Hershberger says.

Calcium Carbide Prices

IT is officially announced that revised prices will come into effect as from January 2, 1950, for calcium carbide sold through the Carbide Distributing Agency, Ltd., 55 Gordon Square, London, W.C.1. Simultaneously a new service of direct deliveries from factory to users for lots of one ton and over will be inaugurated.

Prices per ton of 2200 lb., packed in 220-lb. drums, deliveries to users direct from factory, range between £28 8s. 9d. and £26 8s. 9d. for grades of 50/80 mm. down to 2/4 mm. in 4-ton lots and over; for 1 ton but under 4 tons, £28 18s. 9d. to £26 18s. 9d. Deliveries to users from merchants' warehouses, 4 tons and over £30 8s. 9d. to £28 8s. 9d. (reduction ranging from £2 5s. to £4 5s.); 4 cwt., but under 4 tons, £30 18s. 9d. to £28 18s. 9d. (reduction from £3 10s. to £5 10s.); under 4 cwt., £31 8s. 9d. to £28 8s. 9d. (reduction from £4 to £6).

Calcium carbide packed in 100 lb. or 110-lb. drums will cost £1 per ton more in all cases.

NICKEL BROMINE DRUMS

Replacing Lead in U.S.A.

SATISFACTORY container materials for dry bromine have, after extensive tests, been recommended by the Metal Packages Committee of the U.S. Manufacturing Chemists' Association to the Bureau of Explosives. Objections have been raised to lead-lined drums, the conventional bromine shipping containers, because of their heaviness, cost and liability to corrosion; they are also difficult to examine for leaks owing to the nature of their construction.

An investigation was undertaken which showed that nickel or Monel metal drums can be constructed to eliminate these disadvantages. Corrosion tests carried out and the design of a suitable type of drum are described in detail by Mr. George S. Haines, of the Food Machinery and Chemical Corporation (*Industrial and Engineering Chemistry, 41*, 2792-97). Drop tests were claimed to show excellent impact resistance, with no evidence of leakage.

An addition to the Interstate Commerce Commission regulations now permits the use of nickel or Monel drums of not over 10-gal. capacity and containing not more than 225 lb. net of bromine (in compliance with other U.S. Standard requirements).

Pilkington's to Open in Canada

PILKINGTON Brothers, the St. Helens glass manufacturers who provide nearly all British flat glass exports, are to build a factory in Canada at a cost of $3 million. Canada is one of the largest markets for Pilkington's; last year flat glass exports from this country exceeded £4,250,000 in value. Canada has been taking nearly a quarter of that amount. Pilkington Brothers have had interests in Canada for some time, and there was a move before the war to start production there, but changes in the Canadian tariff altered the prospects. The new Canadian factory will be built on the outskirts of Toronto, and is expected to be in production by 1951. Up to the end of August last, imports from the United Kingdom were valued at $1,396,000, and from the United States $1,534,000. Another flat glass factory is being built by Pilkington Brothers in South Africa, and will be in production early in 1951.

AMERICA'S NEW CHEMICALS & EQUIPMENT

Advances Shown at Chemical Industries Exposition

REFLECTING the marked progress that has recently been made in the evolution of new chemicals and in chemical processing and methods of evaluation on all fronts, the 22nd Exposition of Chemical Industries in New York (November 28 to December 3) fully lived up to its aim to provide a common meeting ground for management, research and production personnel, of whom more than 45,000 attended.

The scope of the exposition included everything required to bring the research laboratory or the chemical processing plant completely up to date, and offered many newly isolated substances for experimental purposes. There was an increased readiness to develop new appliances for investigation, new machinery for advanced lines of manufacture, and even to design and build whole new chemical plants.

New chemical substances and newly tested forms of some of the older and better known bases played a dominant rôle in the exposition. The General Aniline and Film Corporaton, New York, offered iron pentacarbonyl in liquid form and carbonyl iron powder. The carbonyl iron powder has proved effective experimentally as a catalyst in the Fischer-Tropsch reaction for gasoline, and the liquid, pentacarbonyl as a substitute for tetraethyl lead, the anti-knock agent for motor fuel. In the powder form it is a standard component of the cores in television sets and in electronic instrumentation. The carbonyl iron powder has a particle size equivalent to fine talcum powder and contains no metallic impurities. The particles are spherical and have a shell structure.

Powdered Metals as Fuels?

Aluminium, magnesium and alloy powders are being widely adopted as chemical reagents and in the manufacture of protective coatings. One of the newest applications in this field is the use of unpolished aluminium powders as jet-engine fuels. (The Magna Manufacturing Company, Haskell, New Jersey.) No jet aircraft has yet been flown using powdered metals in place of conventional petroleum fuels, but the principle is the subject of research by the U.S. National Advisory Committee for Aeronautics and the U.S. Air Force.

Desoxycholic acid, the most important intermediate in the production of cortisone (Compound E), was shown for the first time by Winthrop-Stearns, Inc., New York, which claims to have developed a synthetic process which increases and makes more economical the production of desoxycholic acid from ox bile.

Another innovation, by the Atlas Powder Company, Wilmington, Delaware, was the production in commercial quantities of 97 per cent stearic acid, with iodine values less than 0.5 per cent, unsaponifiables less than 0.2 per cent.

New Insecticide

The Hercules Powder Company, Wilmington, Delaware, have developed the new member of the rosin and turpene family, toxaphane, an agricultural insecticide toxicant which has come into prominence since the last chemical show two years ago. Synthetic resins for paints, varnishes, adhesives; chemicals for the petroleum industry and for use in the manufacture of synthetic rubber, are other derivatives whose principal source is the stump of the southern pine, which is currently yielding scores of useful chemicals.

Hercules also reported progress in developing cellulose products from cotton linters. From " chemical cotton " come the new flame-resistant cellulose acetate base for hundreds of plastics products, nitrocellulose base for lacquers, sodium carboxymethylcellulose, the CMC used in modern detergents, and now cumene hydroperoxide for " cold rubber," and a chlorinated rubber base for chemical resistant paints.

The Carbide and Carbon Chemicals Corporation displayed for the first time some of the earliest products made from Dynel, a new wool-like synthetic fibre spun from a copolymer of acrylonitrile and vinyl chloride. The company also presented a new family of synthetic fluids and lubricants, primarily for industrial purposes, differing chemically and in performance characteristics from petroleum oils, animal and vegetable oils, silicones and other synthetic oils. The new products are reported to have little effect on most natural and synthetic rubbers and common gasket materials, and to be inert to the common metals, and there is little change of viscosity with change of temperature.

Revolutionary changes in filtration

principles are no longer looked for, so that the relatively numerous modifications shown in New York have commanded much interest.

To eliminate metallic pickup and for use where liquid to metal contact is objectionable, Ertel, a hard rubber filter is being offered. The hard rubber frames were designed to eliminate breakage of the sheets (either filter paper or asbestos filter sheets). One model is a 10-disc unit having 2350 sq. in. of filter surface, and there are 100-disc units having ten times the capacity. Filtration capacities, based on viscosity of water and on filter sheet density, range from 5 to 50 g.p.m.

Multi-Purpose Filter

For filtering plating solutions and chemical liquids, the same company (Ertel Engineering Corporation) displayed its cylinder type multi-purpose disc filter. This has independently tightened filtering elements to provide a positive seal and permit use of various types of filter media; and a cylinder closure, so that after the filtering elements have been sealed the outer cylinder, independent from the filtering unit, is easily closed. The filter is built in sizes to accommodate from four to 30 asbestos filter discs, filter cloths or filter paper. Because of the enclosed principle there is no loss of liquids due to evaporation or drippage.

Titeflex, Incorporated, Newark, New Jersey, displayed industrial and laboratory filters distinguished by (1) simplified backwashing, to facilitate cleaning; (2) high pressure pumps, to permit efficient operation over longer periods of time; and (3) permanent filtering elements employing a filter aid. The equipment is cleaned by backwashing (reversing the flow through the membranes). Cleaning is completed in a few minutes and manual removal of residue is unnecessary.

A continuous centrifugal filter for separation of solids from liquids, offered by the Bird Machine Company, South Walpole, Massachusetts, dispenses with cloths, vacuum, filter media or auxiliaries, and deals with a wide range of feed slurries. Solid content may be coarse or fine (from a fraction of a micron to ½ in. or coarser), and may be hot or cold. The average liquid retention is said to be less than a minute and solids are handled in 15 seconds. Continuous, precisely controlled application of centrifugal sedimentation is the basis.

The display of instruments and controls amply demonstrated that instrument makers are providing the tools required for research as rapidly as the demand develops, and in some cases anticipating requirements. One estimate indicates that of all new items for use of the chemical industries provided since the last exposition in 1947, more than 25 per cent are instruments.

To simplify analyses, metal treating industries are offered a new tube for monitoring combustion gas mixtures. The Viscotron, developed by Charles Engelhard, Inc., East Newark, New Jersey, plugs in like a radio valve and takes in gas through its base to activate a sensitive platinum element contained in a hard glass tube, by which signals are made to a recording instrument, a "Controlled Atmosphere Indicator." It is also useful as an explosion indicator and for maintaining combustion efficiency in ceramic kilns and coke ovens.

A new automatic fraction collector for use in the relatively new field of separation by chromatography was exhibited by the Technicon Chromatography Corporation, New York City. This will automatically collect any number (up to 200) of rigidly controlled samples of predetermined fluid volumes, controlled by a photo-electric cell.

Automatic Operation

The exposition demonstrated the continuing trend toward automatic operation. Among the newer applications the Brabender Corporation, Rochelle Park, New Jersey, included a recording plastograph, which uses the dynamometer principle to measure and record in graph form the plasticity or consistency of any material from light viscous substances to unvulcanised rubber; a recording viscograph, said to be the first of its kind made to heat and cool test material at a constant rate of temperature change (20° C. to 150° C.), graphing temperature and viscosity by means of a single chart line.

Two new instruments given their first public showing by the Perkin-Elmer Corporation, Glenbrook, Connecticut, were a newly developed universal monochromator and a double beam infra-red spectrophotometer. The former covers the ultraviolet, visible, and infra-red regions of the spectrum when suitable prisms or gratings are used. The optics are totally reflecting so that the instrument can be focused with visible light for use in ultraviolet or infra-red. The collimator is an 18° off-axis paraboloid of 270 mm. focal length, and the effective aperture of the Littrow mount is f/4.5. The prisms available are fused quartz, crystal quartz, glass, LiF, CaF_2, NaCl, KBr or KRS-S.

SULPHATE OF AMMONIA TOTALS

U.K. Production, Consumption and Exports

DURING 1948/49 world consumption of fertiliser nitrogen reached the record figure of about 3.5 million metric tons of nitrogen. In view of the growing recognition of the vital part played by nitrogen in the production of food, a considerable increase in fertiliser nitrogen capacity is now planned in many countries, states the 29th annual report of the British Sulphate of Ammonia Federation, Ltd.

The trend of world fertiliser consumption over the last 46 years has been one of continuous expansion, despite setbacks due to wars and economic crises. It has increased roughly 10 times since 1903.

Propaganda Work

The report recalls that 1948/49 (to June 30) was the 52nd year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the association, the federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd.

The world total production of fixed nitrogen for all purposes in 1948/49 (expressed in thousands of metric tons) was 4152.1, against 3561.8 in 1947/48 and 3112.7 in 1938/39. World consumption figures were: 4084.4 in 1948/49, 3564.7 in 1947/48, and 3107.3 in 1939/39.

In view of the increased production available the International Emergency Food Council in Washington announced on April 19 that the system of international allocation of nitrogen fertilisers would cease to operate as at June 30 this year.

The figures in the table below show that the total home production of nitrogen products in 1948 was 17 per cent higher than in 1947 and 9 per cent over 1946. Fertiliser products increased by 16 per cent (7 per cent over 1946) and industrial products increased by 22 per cent (21 per cent over 1946). It will be recalled that 1947 was an exceptional year owing to the fuel shortage.

Agricultural consumption in the U.K. of sulphate of ammonia (tons of 2240 lb.) in 1948/49 was 593,779, against 632.916 in 1947/48. Home agricultural consumption of nitrogen (metric tons N) in 1948/49 was 185,104, against 185,410 in 1947/48.

During the year there has been increasing insistence by the Government upon the need for a larger total agricultural output and greater official emphasis on the part that fertilisers must play in achieving this end. Some disappointment has been expressed in ministerial circles on the failure of farmers to sow the wheat acreage required and special price inducements have since been offered in order to recover the lost ground. In fact, some 300,000 acres which should have been sown with cereals were left under or put back to grass and the total increase in grassland was 120,000 acres. These figures are significant as they account to a great extent for the reduction in demand for sulphate of ammonia for direct application.

Demand from Compounders

The open winter was also a factor in reducing the demand for direct application, as autumn sown crops were so forward and vigorous in the early part of the year that few farmers considered it advisable to use sulphate of ammonia for top dressing. The excessively dry period which followed was a further discouragement. This reduction was, however, offset by a further increase in the demand from the compounders, who again exceeded the previous year's record figure of production.

The Ministry of Agriculture, through the National Agricultural Advisory Service, has intensified the campaign for increased output from grassland and has achieved some success in substantially

U.K. PRODUCTION OF NITROGEN PRODUCTS AND OF AMMONIUM SULPHATE
(Tons of 2240 lb.)

	Total output of nitrogen products expressed as 25 per cent ammonia				Included in the total	
Calendar Year	England and Wales	Scotland	Northern Ireland	Total	Industrial Ammonia Products (expressed as 25 per cent ammonia	Sulphate of Ammonia as such (actual tons of product)
1939	783,400	72,400	1,000	856,800	263,900	483,300
1946	1,294,100	211,200	1,200	1,506,500	293,300	833,700
1947	1,244,900	162,000	1,700	1,408,600	291,200	796700
1948	1,438,100	209,300	1,400	1,648,800	355,100	901,000

increasing the amount of silage made during the year. Furthermore, the practice of grass drying is steadily increasing, both on a co-operative basis and with individual farmers. In order to achieve a large increase in output from grassland a great number of farmers throughout the country will have to raise their standard of management. Recognising this need the federation's agent, Imperial Chemical Industries, Ltd., has during the year continued preparations for an intensive and long-term development of this potentially large outlet for sulphate of ammonia.

The total shipments of sulphate of ammonia from the U.K. for 1948/49 and some previous years are shown separately in the full page table below. Up to June 30, these shipments were allocated by the Board of Trade in collaboration with the International Emergency Food Committee.

The following are the prices per ton to British farmers, delivered in 6-ton lots to buyers' nearest station, for neutral quality 30.6 per cent N. minimum:—

	1947/48	1948/49
	£ s. d.	£ s. d.
Summer	9 11 0	9 16 0
Spring	10 8 0	10 8 0

(*continued overleaf*)

U.K. EXPORTS OF SULPHATE OF AMMONIA

	U.K. Customs returns					Actual shipment figures Fertiliser Years ended June 30					
To	1929/30	1936/37	1937/38	1938/39	1939/40	1943/44	1944/45	1945/46	1946/47	1947/48	1948/49
						(Tons of 2240 lbs.)					
Scandinavia ...	—	—	—	—	—	300	884	—	50	497	292
U.S.S.R.	20,285	—	—	—	—	—	—	—	—	—	—
Holland and Belgium ...	—	—	314	5	—	—	10,718	4,871	1,249	3,004	3,298
France	43	—	6,917	—	—	—	14,617	19,981	—	—	—
Portugal	7,711	11,797	19,520	19,428	2,079	—	9,828	—	—	6,708	4,580
Spain	194,205	18,717	9,576	5,842	3,846	—	—	—	—	5,580	2,923
Italy	4,878	—	—	—	—	—	4,444	—	—	—	—
Other Europe ..	22	333	361	499	306	509	4,178	9,918	735	606	633
Palestine/Israel ...	925	918	1,399	2,002	723	11,178	10,024	4,570	13,759	5,253	4,097
Other Levant ..	328	657	1,093	697	825	10	664	2,971	4,131	1,854	4,446
India, Pakistan and Burma	23,881	48,539	47,056	66,027	46,497	10,305	53,342	130,795	108,241	76,313	55,553
Ceylon	13,431	8,963	18,491	18,257	18,807	1,500	28,977	32,813	35,495	38,349	35,335
Malaya and British Borneo	2,625	20,647	32,479	23,880	17,662	—	—	782	18,467	3,209	13,653
Dutch East Indies	30,522	—	547	221	—	—	—	—	—	—	—
China and Hong Kong	109,888	36,726	41,194	33,761	—	—	—	1,105	7,607	4,970	9,729
Japanese Empire	158,971	541	—	—	—	—	—	—	—	—	—
Other Asia ...	19	601	703	1,078	533	—	—	—	1,413	449	500
Madeira	1,204	1,177	1,098	1,282	116	—	—	—	—	—	—
Canaries	19,464	9,494	10,776	12,392	176	—	—	—	—	2,923	5,466
Egypt	1,751	363	255	2,428	1,960	13,822	28,323	8,708	683	3,440	2,450
Sudan	2,649	2,072	2,075	2,856	1,116	—	—	7	—	17	15
West Africa ...	3	180	152	61	11	22	1,057	883	126	496	1,369
East Africa ...	157	886	1,503	1,112	758	6	941	815	1,206	1,343	2,559
South Africa and Rhodesia ..	1,986	8,064	15,186	16,818	15,635	—	8,013	2,581	6,149	5,336	6,588
Mauritius	6,688	14,031	11,900	10,258	15,875	—	6,471	—	2,500	11,500	10,631
Other Africa ...	14	—	—	5	—	—	852	499	228	320	300
Australia and New Guinea ...	9,960	22,141	26,719	35,552	27,841	—	1,960	23,368	17,549	14,245	7,787
New Zealand ...	10,123	5,743	5,540	4,860	3,348	1,218	—	—	—	—	—
Fiji Isles	1,919	3,389	2,575	4,011	3,791	—	100	1,250	1,910	2,085	2,669
Canada and Newfoundland ...	10	110	—	149	—	—	—	—	—	—	—
U.S.A.	—	—	—	—	—	—	—	50	642	—	—
Central America ...	—	2	—	8	—	14	—	—	5	—	75
British West Indies	3,745	15,672	19,911	15,550	22,722	14,998	12,294	14,454	12,535	17,409	29,356
British Guiana ..	5,830	9,854	9,860	11,043	14,339	6,161	6,634	12,079	7,211	9,652	12,639
Peru	533	1,079	1,183	1,032	497	—	—	—	—	—	—
Other South America ...	635	327	66	147	51	—	—	40	105	2	142
Total ...	634,405	243,923	288,449	291,261	199,514	60,043	204,321	272,540	242,086	215,560	217,985
Channel Islands ...	1,304	1,422	1,548	1,678	—	—	—	338	1,309	981	706
Eire	19,264	22,780	27,469	28,929	38,213	640	2,129	1,711	4,406	24,057	25,281
Total Exported	654,973	268,125	317,466	321,868	237,727	60,683	206,450	274,589	247,801	240,598	243,972

Plastics for Packaging

Likely Growth of U.K. Industry

THE probability that plastics as packaging materials would, before long, have an important influence in Britain's export trade was stressed by Dr. Harry Barron in a paper delivered recently in London to the Institute of Packaging.

"It is probable," said Dr. Barron, "that packaging is the largest individual consuming outlet for plastics in U.S.A. About 150,000 tons, or roughly 20 per cent of total output is used for packaging, a very large part being absorbed by thermoplastic films, or as treatment for papers. And this usage is actually considered to be in its infancy."

In Britain, he said, the consumption of such plastics in the packaging field was quite small—a minute fraction of the American consumption. But since, in most industries, we tended ultimately to attain a relationship to the U.S. volume, often about one-sixth, it was evident that the potential future of plastics in packaging was very great.

The more important materials now in use in the U.S.A. were: Cellulose plastics, cellulose acetate, cellulose acetobutyrate, and ethyl cellulose. Vinyl plastics: polyvinyl chloride, polyvinyl copolymers, polyvinyl chloride-acetonitrile, polyvinylidene chloride, polystyrene, polyvinyl acetals and polyethylene; polyamide (nylon) plastics and rubber hydrochloride. The only types commercially available in the U.K. were cellulose acetate, polyvinyl chloride, polyethylene, and rubber hydrochloride.

An outstanding application of polyethylene in the packaging field had been the evolution of the unbreakable plastic bottle. Production in the U.S.A. was already on a very large scale, 23 million having been produced in the past two years. The cost was about 2½ times that of glass, but the Americans had been insatiable. Production had now started in the U.K.

This served as an example of the importance of using plastic films when packing for sale in export markets where competition was severe, such as in the U.S.A. When overseas buyers had become accustomed to a certain type of packaging, they tended to reject the same class of goods packed in another manner.

Dr. Barron pointed out that, when trying to sell a South American buyer equipment he had been accustomed to receiving from U.S.A. packed in rubber hydrochloride or polyvinylidene chloride films, one might have greater difficulty in selling him the same type of equipment, unless one could provide a form of packaging at least as good.

Dr. Barron discussed each plastic film material in detail under the following headings: Physical properties, tensile strength, tear resistance, flexibility (down to low temperatures), heat sealing, water absorption, water-vapour permeability, solubility in solvents, resistance to oils and greases, heat and combustion, oxidation and mould growth, chemicals, gas transmission, and area of film obtained per lb. of material (an important factor in determining cost).

SULPHATE OF AMMONIA TOTALS

(continued from previous page)

Since 1934/35 summer prices have been increased by 1s. 6d. a ton per month up to the spring price. Since 1940/41 prices to farmers have been "pegged" and producers have received a subsidy on home agricultural sales to cover increases in cost not included in the price. Prices were increased by 1s. per ton from July, 1946, and a further 5s. per ton from October 1947, to cover increases in railway freight rates.

The following are the final average prices to members per ton produced, based on sales realisations for all deliveries, home and export, free on rail at makers' works in secondhand bags, after making allowance for adjustments in the value of unsold stocks and provision against losses in certain markets:—

	For 20.4 per cent Nitrogen Ordinary Quality	For 21.1 per cent Nitrogen Neutral Quality
1924/25	10 18 0	12 5 6
1930/31	3 10 7	4 12 10
1938/39	4 19 11	5 10 11
1943/44	7 17 5	8 10 1
1944/45	8 13 1	9 5 9
1945/46	9 1 11	9 14 7
1946/47	9 8 4	10 1 0
1947/48	9 16 4	10 9 0
1948/49	10 6 6	10 19 2

On June 30, 1949, the federation comprised 79 members, including the National Coal Board, which represents 28 individual undertakings included in the total of 106 members as at June 30, 1948. There have been no withdrawals.

MINERAL SOURCES OF FLUORESCENCE

Preparation and Application of Organic Salts

THE scientific basis of the industry of fluorescent salts, and the manufacture of mineral and organic salts employed, were described in a paper delivered by Dr. J. Heubel, of the Sorbonne, at the conference in Paris of the Centre de Perfectionnement (*Chim. et Ind.*, 1949, 62, 461-465).

French contributions in this field were of fundamental importance, particularly the introduction of stable substances into an electrical discharge tube in 1935 by André Claude and his fellow workers (Etab. Claude, Paz et Silva). It was then possible for the first time to obtain several thousand hours' lighting without diminution in intensity.

Mineral salts are the most generally used at present, but the organic salts, more numerous and varied and also more fragile, are of considerable scientific interest and have certain limited applications. Among the mineral salts are sulphides, silicates, tungstates, molybdates, alkaline earth oxides, etc., and also more especially the halo-phosphates of the type $Ca_3(PO_4)_2$, Ca(Cl,F).

Zinc-Cadmium Sulphides

The most commonly used sulphides are those of zinc and zinc-cadmium which have a definite fluorescence when roasted. Activators employed in this connection are silver or copper, of which only a mere trace is needed (0.001-0.0001 per cent). Maximum emission, however, is obtained by the use of manganese in much larger proportions, up to a few units per cent. The maximum, 5800 Å, is constant whatever the proportion of cadmium sulphide.

Alkaline earth sulphides or mixtures of sulphides and sulphates which can be activated by several metallic elements, have also been proposed. The calcium sulphide and sulphate may be obtained either by directly reacting lime and sulphur, or by passing carbon disulphide vapour at high temperature over a mixture of sulphate and oxide in an inert atmosphere; in both cases the luminescent agent must be added before the reaction.

It has been found that strontium sulphide activated with bismuth gives the best results. But in general practice the silicates are preferred owing to their greater stability: they are usually activated with manganese, and excited by X-rays or other source. Among the most commonly used are willemite (*o*-silicate of zinc) or cadmium silicate.

The preparation of these salts requires considerable care, as all depends on purity, judicious mixture, and mode of preparation. Until recently it was necessary to use a mixture to obtain white light, but from research of MacKeag and Randy this can now be achieved with a single substance, namely, the halo-phosphates, which may be activated by any one of several agents.

Patented Processes

The use of these salts has been developed in England; and the patents have been bought in the U.S.A. where large scale plans are in progress. In France, too, it is expected that they will very soon be available.

Among impurities which must be specially avoided is iron which even when present as a trace (10^{-5}) may reduce the fluorescence; in the case of calcium tungstate it is as much as 17 per cent. Spectrographic control of analysis is indispensable; air must be strictly conditioned; and iron parts in plant avoided. Grinding and mixing of constituents are done in porcelain mills, and the product heated to about 1200°C., in either an inert or reducing atmosphere. Attempts are being made to improve the process with lower temperatures.

Solutions of salts are first prepared, *e.g.*, of zinc or cadmium nitrate, or zinc sulphate, and these are purified by electrolysis and fractional crystallisation. Intermediate products—oxides, carbonates, etc.—are precipitated by ammonium carbonate, hydrogen sulphide or hydrochloric acid. These purifying refinements may be avoided if sufficiently pure raw materials are available.

Manufacturing Precautions

Various precautions are indicated in the preparation of zinc sulphide, tungstates, etc., and silicates; and operation of the luminescent tubes is briefly described.

The organic salts are more varied, more delicate, and less extensively used. Their principal field at present is in research, publicity, and in the decorative and theatrical arts; but further possibilities are very extensive and important. Their luminosity is more complex than that of the inorganic or mineral salts, and among its principal governing factors are: solvent used, concentration, and adsorption on solids.

In the aliphatic group the aldehydes and ketones yield the most intense luminescence, and the carbonyl section is also of considerable interest. Most of the benzene derivatives in the aromatic group are fluorescent, as also many of the compounds of cyclohexagonal structure, whether homo- or hetero-geneous.

Organic Salts

While the methyl, amide, hydroxyl groups and the cyanide and non-saturated radicals increase the fluorescence, the acid or nitro groups have the opposite effect. A large number of these organic salts have been prepared for fluorescent work.

Among the present applications of fluorescent salts, luminescent paints probably come first, their use being widely extended during the war. They are usually prepared by incorporating in a suitable vehicle—varnish or oil—an organic luminescent material to the extent of about 0.15 per cent by weight, and it should, of course, be inert to the vehicle.

If the paint is applied to a substratum this should have good reflective power for ultra-violet rays. According to Luckiesh and Holladay the best results are obtained with pigments of MgO, MgB_2O_3, or Al_2O_3 base, or a mixture of Zn and Ti oxides. Cellulose varnishes are the best transparent media, while for opaques ZnS can be employed. White luminescence may be obtained with a mixture of rhodamine, primuline, and auramine.

Textile and Plastic Uses

Other uses are in connection with textiles, as Francolor, with plastics, and other material. Brilliant effects have been achieved in the theatrical field, as in the play " Soulier de Satin " at the Theatre-Français, and more recently in "L'Auberge du Cheval Blanc " at the Châtelet. An interesting new application by M. Deribère in France is in the examination of engravings that have become old or worn, and in the investigation of surface states as to roughness, etc.

Yet another promising field is that of analysis, both quantitative and qualitative, in pH fluorescent indicators, in various physical data evaluation, histologic specimen examination, etc.

Present consumption of these materials in France, where the demand is much in excess of supplies, may be reckoned at 1-2 tons only. About 85 per cent of this is for general lighting or photo-luminescence, as in television screens. About 300 km. of tubes are produced per annum, and this is increasing.

The industry in France is not, however, progressing as quickly as it might, possibly for two reasons: consumption is still too small in value to justify or require large developments in research or production; and there is still insufficient unity of action or co-operation.

Conditions are different in the U.S.A. and in some other countries, such as England and Holland. In Italy it is in its initial stages; in Russia, Hungary, and Czechoslovakia it is limited mainly to cathode tubes for control instruments. There are great potentialities and further research with a view to reduction of costs and increase in efficiency and stability should give satisfactory results.

ITALIAN ALUMINIUM PROSPECTS

MUCH has been said and written concerning the possibilities of aluminium industry in Italy after the loss of Istrian mines. It is certain that the other sources of bauxite Italy has at its disposal are by no means as rich as the ones now held by Yugoslavia. At the same time, statistics show that, not only is the production of aluminium in Italy now sufficient for home needs, but Italy exported in 1948 various aluminium products equivalent to 22,105 tons of metal, some 10 per cent more than in 1938.

The possibilities of Italy, however, are not yet exhausted in this field. There are plenty of beds of lower grade material near Civita Castellana, Lake Braccione, Sessa Aurunca, Roccamonfina, Gargano and Abruzzi.

Italian technicians are planning to supply the raw material to countries such as Germany, Sweden, Norway, and Switzerland, whose bauxite resources are insufficient but whose equipment and supplies of electric power could make economical use of the poorer types of Italian material.

There are also several schemes to exploit the beds of Civita Castellana and Bracciano on the spot. The cost of the plants needed is heavy, but recent studies made in this direction are encouraging, especially as the methods evolved promise also a good yield in potassium salts.

MECHANISM OF HOMOGENEOUS PYROLYSIS

Franco-Belgian Progress in a Fundamental Research

PYROLYSIS in the gaseous phase of organic substances is of importance from two points of view: (a) industrial, as in the cracking process, and (b) scientific, in the study of the mechanism of chemical reaction. It is a wide and ever-broadening field of profound interest, and part of it has been recently surveyed by Michel Niclause, of the Faculty of Sciences, at Nancy, in a paper presented to the Société Chimique de Belgique (*Ind. Chim. Belge.*, 1949, *14* (3), 71-80).

An introduction covers some of the pioneer work of Hinshelwood and others, and the experiments which supported the hypothesis of an initial decomposition of the molecule into free radicals. An attempt is made to trace the ultimate fate of these radicals, the further reactions, and the final products. The theory of chain mechanism is also considered.

'The various well known methods of detecting free radicals and atoms are briefly described, such as mirrors, induced reactions, *p*-hydrogen and mass spectrometry.

On the subject of chain mechanism the earlier work of Rice and Herzfeld is reviewed, as well as the recent attempt of Goldfinger, Letort and Niclause to generalise the kinetic systems proposed by Rice and Herzfeld, and evolve general laws combining mechanism and order. (V. Henri Memorial Volume, Liège, 1947-8, pp. 283-296).

Types of Radicals

In this last named work the authors mentioned consider it necessary to distinguish two types of radicals: (1) those which react only in contact with another group or entity (particule) and may be called β radicals to denote their bi-particulate nature; (2) those which will most likely spontaneously decompose, are thus mono-particulate, or μ radicals.

The two cases are considered in forms in which one or the other or both of these types of radicals take part; and in each case the possibility of ruptures by triple collision with a molecule M of the initial product has also been considered, as well as that of a bimolecular initiation.

Some results are tabulated.

The theory of chain mechanisms enables the total activation energy of homogeneous pyrolyses to be determined from the probable values applicable to elementary processes. This is exemplified in the case of acetaldehyde. Inhibitions and inductions are discussed, the former with reference to the nitro group and to propylene (Hinshelwood *et al.*), and the latter from the point of view of the effect of traces of oxygen (Letort, *Comptes Rendus*, 1933, *197*, 1942).

Hinshelwood's views on partial induction by NO are criticised as somewhat arbitrary. Contrary to that author's hypothesis, it is now suggested that the maximum inhibition by the NO group by no means corresponds with the complete elimination of the chains. The fact that small amounts of NO inhibit, and large amounts accelerate numerous pyrolytic reactions seems rather to indicate that two antagonistic phenomena are involved: the one inhibitive in some directions, and the second accelerative in others. This has been suggested by Gol'danskii (*Upsekhi Kim.*, 1946, *15*, 63; *Chem. Abs.*, U.S., 1946, 69557). At all events it appears that the present experimental results may be interpreted without recourse to a dual mechanism hypothesis.

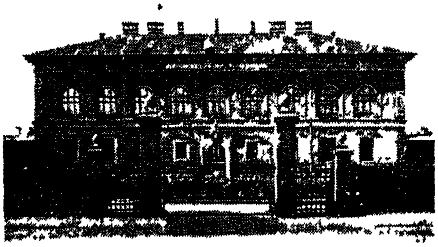
Chain Mechanisms

It has been shown that the theory of chain mechanisms through free radicals helps to explain a series of experimental facts, *e.g.*, noted in the homogeneous pyrolysis of certain organic substances, such as saturated hydrocarbons, aldehydes (except formaldehyde) and ethers: (a) detection of free radicals in normal pyrolysis, and (b) induced decomposition.

It would be premature, however, to deduce a free radical chain mechanism in normal pyrolysis in these subsubstances just mentioned as a universal rule. Account must be taken of the existence of other substances—toluene, ethyl bromide, etc.—in which free radicals can be observed but not necessarily also an induced decomposition. It may indeed be generally concluded in such cases that, although free radicals are present, pyrolysis does not involve a chain mechanism. In other words, the formation of free radicals in the primary reaction stages is a necessary condition but by no means necessarily involves chain reactions. In other cases again it may be necessary to invoke direct intra-molecular action (Rice and Teller, *J. Chem. Phys.*, 1938, *6*, 489; and C. C. Coffin, *Can. J. Res.*, 1931-1940).

The CARLSBERG LABORATORY

by J. GRINDROD



The laboratory was founded in 1875

BUILT and equipped by the founder of the famous Carlsberg Brewery, near Copenhagen, in recognition of the practical help science had been to him, the Carlsberg Laboratory is one of the finest scientific institutions in the world. It is financed out of the profits of the business and is controlled by the Carlsberg Foundation, which, in turn, is managed by five professors chosen by and from the members of the Royal Danish Academy of Science.

When framing the statutes of the laboratory, its founder, J. C. Jacobsen, laid it down that " no result of the activities of the institution, whether of a theoretical or a practical nature, shall be kept secret " and the world has benefited greatly by the knowledge which has come from this source.

The laboratory's chemistry department, although devoted to research in general, has naturally worked principally along lines parallel with the industry with which it is so closely connected. For instance, its first head, Prof. J. Kjeldahl, discovered the Kjeldahl method for the determination of nitrogen. Emil Christian Hansen conducted researches in fungi and alcoholic fermenting yeasts. He was able to prove that there were different species of yeast and that they may be cultivated from a single cell. His method was based on Pasteur's experiments and the world's first pure-cultivation apparatus is still in use at the Carlsberg Brewery.

Deep Fermentation

Fermentation, which was once very largely a matter of chance, was brought under control by the use of yeast cultivated under sterile conditions. The yeast grown from single cells is now largely used in the deep-fermentation breweries of the Continent.

At the Carlsberg Brewery fermentation cellars hold the equivalent of 25,000 barrels of beer in vats, of which the largest is equivalent to 672 barrels. Cooled sterile air is blown in under the white vaulted roof. The fermenting beer is kept at a temperature of 7-9°C. (44-48°F.) and is regulated by direct refrigeration in the vats.

A later director of the chemical department, Prof. S. Sorensen, was responsible for the modern technique of measuring hydrogen-ion concentration and conducted much research into the chemistry of proteins.

Micro-Chemistry

Sorensen was succeeded by Dr. K. Linderstrom-Lang, a brilliant scientist, who is the present head of the department. He has pursued the problems of the processes of fermentation and the chemistry of proteins, and he has particularly concerned himself with identifying and measuring the very minute chemical changes that occur in living organisms. He has brought his training as a physical chemist to bear on the technique of micro-chemistry, especially in detecting and measuring the reactions that take place when small quantities of substances, say proteins, are made to ferment.

To this end, he, with Dr. Heinz Holter, his collaborator and friend, has extensively used the principle of the Cartesian diver and its action under varying densities. As a result of their investigations the use of this instrument has been rendered a matter of great precision, and their work during the war years has been the subject of a treatise, in which Linderstrom-Lang has analysed the theory of the diver and Holter has described the technique of its design and how its use with maximum precision and accuracy has been achieved.

Within a very small range, the size of the divers has varied considerably. Their length has been anything between 10 and 20 mm., the cross-section of their necks 0.3 to 1 sq. mm., and volume from 3 to 20 cu. mm.

One of the first divers used by Linderstrom-Lang consisted of a glass bulb which held about 10 cu. mm. of gas, which floated in the bottle with the open tube upwards. A drop of oil, used in the neck to act as a sliding stopper, rose or fell according to the pressure outside the bulb. On the top of the oil drop was an air bubble and this contacted the liquid pressing down the open neck.

Index of Gas Evolved

Into the bulb containing the gas was dropped a very small quantity (say about 1 cu. mm.) of a mixture of protein and ferment, by which a gas-producing reaction was set up. The increased volume of gas raised the oil stopper and some of the liquid beyond the air bubble was ejected from the neck of the bulb. In these circumstances the lighter bulb would be expected to rise, but, by exerting pressure inside the bottle, the bulb was maintained at its original level. Thus the amount of gas produced by fermentation was related directly to the amount of pressure required to maintain the bulb at its marked position.

This type of apparatus was later used for other purposes, such as the measurement of respiration changes in living tissues. Many difficulties and pitfalls were encountered, such as the diffusion of the gas (especially the soluble carbon dioxide) through the oil drop, but most of these were overcome by alternative technique, such as the insertion of loose hollow glass stoppers either inside the drop of oil or inside the fluid pressing into the neck of the bulb.

Many types of liquid have been used but the most effective appears to be a solution of sodium carbonate and sodium chloride containing a small percentage of sodium taurocolate, the latter improving the fluidity of the mixture.

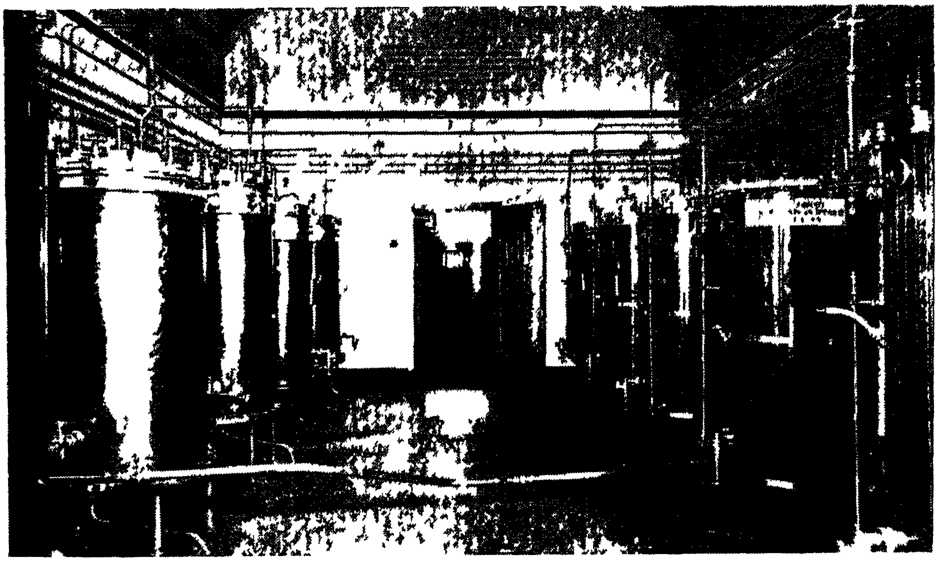
Although operational errors have occurred, results with Cartesian divers are now so fine that their behaviour has been reduced to mathematical equations; detailed instructions for procedure have been tabluated by Holter.

The apparatus is simple and cheap, can easily be replaced and is quickly erected and dismantled.

Among other methods for studying and measuring changes in proteins being used by Linderstrom-Lang, one is based upon the regular diffusion of two fluids of varying density. If, in a vertical column of liquid, a soluble substance is introduced at one end, it begins to diffuse steadily toward the other.

In the same way, if the upper and lower halves of the tube are filled with different fluids, one of which is soluble in the other, then again, regular diffusion takes place. So stable is this diffusion that the tube

(continued overleaf)



Pure-cultivation vats at Carlsberg, including (right) the world's first pure yeast cultivation apparatus, installed in 1883, and still in use to-day

Chemical Properties of Propiophenone

Widening Range of Industrial Applications

THIS alkyl aryl ketone, propiophenone, which is finding widening use in the production of pharmaceuticals, possesses many of the chemical properties of acetophenone. It is a water white to amber liquid having a melting point of 21° C., boiling point of 218° C., and 760 mm. mercury and freezing point (minimum) 17.5° C. The flash point (tag open cup) is 99° C. and (tag closed cup) 88° C.

Propiophenone is essentially insoluble in water, ethylene glycol and glycerine, but miscible with ethyl alcohol, ethyl ether, benzene and toluene. The pharmacological action of this chemical is qualitatively similar to acetophenone, the principal action being a rather deep narcosis or coma. The lethal dose for dogs has been found to be 2.5 grams per kilo. of body weight.

The most important use for propiophenone appears to be in the synthesis of pharmaceuticals, *e.g.*, the production of ephedrine, an amine with pharmacological properties similar to, but differing in degree from, epinephrine (adrenalin).

In the synthesis of ephedrine the first step is the production of the halogen substituted ketone, alpha-bromopropiophenone. This is reacted with methyl amine to give a reaction product, which, after reduction of the ketone group to a carbinol group, yields a mixture of the isomers of ephedrine from which the pharmaceutical preparation can be separated. This is one of the several methods which are now in use.

The related compound, nor-ephedrine, also known as Propadrine NNR, is synthesised from propiophenone by first reacting it with methyl nitrite or butyl nitrite to give isonitrosopropiophenone. This can be hydrogenated to yield Propadrine.

Anti-malarials, such as the hydroxycinnolines have also been made from propiophenone via ortho-aminopropiophenone. Propiophenone is used as a base in compounding perfumes, finding particular value in those simulating such odours as hawthorn, mimosa and new-mown hay. The nitro-propiophenones have very pleasant odours and are assuming growing importance.

Nitration

Nitration of propiophenone with concentrated nitric acid yields a mixture of nitro- and meta-isomers. When the nitration is carried out with fuming nitric acid, a small yield of the para-isomer is obtained. The nitro-propiophenones can be reduced to the corresponding amino-propiophenones. The meta-aminopropiophenones can be converted to meta-propylphenol, or to meta-propyl-anisole, which has a flavour very similar to liquorice.

Some of the condensation products of propiophenone with aldehydes and ketones are of a resinous nature and of interest for use in lacquer and coating formulations, and also as plasticisers. Propiophenone also condenses with itself to form a substituted trioxane, which is reported to be unaffected by alkaline or acid solutions, oxidising agents or by alkali fusion.

THE CARLSBERG LABORATORY

(*continued from previous page*)

may be microscopically graduated for density to an accuracy of three parts in a million.

It will be seen that, if a diver containing a ferment or enzyme is used in conjunction with the vertical fluid column of graded varying density, the extent and even the rate of reaction can be accurately measured. Instead of a diver a drop of liquid (containing the reactionary substance) which does not mix with the liquids in the column may be used.

As well as a department for chemistry the laboratory maintains a physiological department, which has also worked on the properties of yeast. One of the noteworthy results of that was the revelation by Prof. O. Winge of the sexual processes in this fascinating substance.

In 1943 a new department of cytochemistry was formed under the direction of Dr. Holter.

The Carlsberg institution is thus, in every way, an expression of reciprocal action between industry and science and as such it is almost unique. Although Carlsberg is first and foremost a national institution, its reputation and influence is world-wide. Through the entrance hall of the laboratory, which contains the busts of Pasteur and Liebig, have passed many of the world's distinguished scientists, to learn or to collaborate in this impartial enterprise.

SAFETY DRIVE IN BELGIAN CHEMISTRY

Accident Frequency was Reduced 75 Per Cent

BELGIAN experience in the drive to minimise accidents in chemical works, which has been summarised in a contribution at the Fondation Universitaire, Brussels, by Dr. A. de Gheldere, bears witness to the excellent results which can be attained by close and vigorous collaboration, even by a relatively small group. Dr. de Gheldere described the safety and hygiene work, and results, of the Union Chimique Belge, of which he is a director.

Belgian chemical industries, he recalled, had become alarmed, in 1938, at the rising curve of industrial accidents and had determined to undertake a long and vigorous security campaign.

The Union is a group of about 12 chemical companies and several laboratories, employing 5000, as well as 1300 chemists and executives. In 1938 a Service de Securité was established, comprising in the first place a safety engineer in each factory, assisted by a number of Agents de Securité, all under the control of a central council at headquarters.

A Government department is engaged in very similar work—Comités de Securité-Hygiène et Embellissement des Lieux de Travail—created by a decree of December 1946. The functions of the Union organisation are complementary to the official ones and, during the past 10 years, says Dr. de Gheldere, have gone far beyond the official level of minimum safeguards

Technical and Human Causes

Their work is concerned with two main aspects: technical causes of accidents, and human causes—psychological or physiological. The former is sub-divided into collective and individual causes and preventives. A voluminous literature, based on long experience, has been compiled and placed at the disposal of the Association des Industriels de Belgique. The various preventive measures are described, and colour schemes are amply illustrated.

Works are periodically inspected by experts of the AIB. Among the safety literature which is distributed is the *Bulletin de Securité-Hygiène* of the Union Chimique Belge, issued quarterly, in French and Flemish editions. A bronze and marble trophy is presented annually to the works that shows the largest reduction of accident rate compared with the previous three years—not necessarily the works with the lowest accident rate. A novel characteristic of this campaign is the establishment in many of the factories of "museums," in which are displayed collections of miscellaneous articles, etc., which have constituted sources of accident, such as defective tools, inefficient insulations, etc.

Accident Rate

Some of the results of the security campaign are recorded. In 1937 the accident rate—or frequency expressed as the number of accidents per million hours of work—was 80, an alarmingly high figure. In 1939 the rate had fallen to 35.6. During the war it rose to 54.9. In 1944-45 it fell again to the pre-war level. In the great activity of 1946, with many new and untrained workers, the rate rose slightly to 37. By 1948 it was only 19.3—a remarkable achievement.[1] These figures relate only to works of the UCB.

Official figures, for comparison with Belgian industry generally, are not up to date, extending only up to 1943. Accident rates for (a) chemical industry generally, and (b) all industry during 1941-3 were as follows:—

	(a)	(b)
1941	50	82
1942	65	90
1943	60	95

The corresponding figure for some Belgian metallurgical works has been as high as 400.

In England, of which some data are given in the Belgian paper (taken from the *Industrial Accident Prevention Bulletin*), the rate in chemical industry represented by 189 members, ranges from 0 to 86, the average being 21.9. In the U.S.A., according to the National Safety Council, the frequency rate has fallen 70 per cent between 1930 and 1947. In France, according to the *Bull. de l'Assocn. des Industriels de France*, the average rate in the chemical industry in 1947 was 103.

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[1] Since the paper was read, figures for 1949 have become available from the UCB :—
1st qtr. 16.0 : 2nd qtr. 17.1 : 3rd qtr. 13 5

Blast Furnace Explosions

Men ran to safety when four explosions occurred at an iron and steel works near Rotherham recently. No one was hurt, and repairs were expected to take only a few days.

Some Characteristics of French Kieselguhr

Parallels with Diatomite

From a FRENCH CORRESPONDENT

FRENCH experience in developing uses of indigenous kieselguhr derive interest from the number of points of similarity with the current exploitations of diatomite deposits in the Island of Skye.

In part of Touraine—the valley of the Cher and Indre rivers—where kieselguhr is extracted, the cretacious formation constitutes the major part of the soil. The upper layer is composed of fine powdery silica (Langé), which is used in pottery. Its origin was considered purely chemical as it was believed to be derived from the alteration of silex (which is abundant in the area) and no trace of infusoria was found on microscopic examination.

Radiolarites

More thorough study has, however, contradicted this belief. If certain powdery varieties of silica have undoubtedly a chemical origin others are without doubt formed by the skeletal remains of radiolaries, miscroscopic animalculæ of the Rhizopod family. This agglomeration of organic fragments should correctly be called radiolarites. Their chemical composition is exactly the same as that of diatoms; only the form of the siliceous particles is different, and that does not affect many applications. In the case of radiolarites, the form is globular, not flat or radial.

The chemical composition, expressed as percentages by bulk, of some of the better known radiolarites and diatomites is given below:—

	Radiolarites		Diatomites	
	Langé	Baudres	Algeria	Germany
Silica SiO_2 ...	89.20	91.40	81.80	85.40
Alumin Al_2O_4 ...	5.30	3.60	2.70	2.20
Ferric oxide Fe_2O_3	1.80	1.40	1.20	2.97
Titan oxide TiO_2	0.20	0.20	—	—
Lime CaO ...	0.70	0.70	3.00	0.70
Magnesia MgO ...	0.60	0.60	0.20	0.50
Loss on heating	2.20	2.10	10.50	9.10

The small content of lime, which is constant in Touraine silica, gives the latter a marked superiority in certain uses, most silica varieties being used in very fine powder form.

Practically, whether for insulation, construction, filtration or manufacture of polishing products, no difference need be made between the product of radiolaries and that formed by diatoms.

In the Mesnes quarries at Baudres (Indre Department) the kieselguhr layer crops out and is covered by only a thin layer of vegetal soil. Its total thickness is from 10-15 metres. Within the layer there are strata of kieselguhr 1 to 1.50 m. thick and separated by beds of silex cobbles, and sometimes by clay veins which must be carefully removed after extraction. The stratification is very regular and mostly horizontal.

If extracted fresh, kieselguhr earth is very damp, even during the hottest weather. On an average, it requires the removal of a water content of 25 to 40 per cent before crushing; this is done in special ovens or in ventilated shelters, after compressing the earth into bricks. The latter drying method is preferable, as there is no risk of changing the composition by temperature increase.

In the Cavaliers Works, near Chateauroux, which is one of the best equipped factories in the area, the bolting of kieselguhr is done with sieves of up to 300 mesh, and even smaller for special qualities. The production figure of the Indre quarries is estimated at approximately 10,000 metric tons a year. This could be considerably increased.

Pharmacognosy Recognition Sets

TO cater for the regular demand for specimens of crude drugs, Evans Medical Supplies, Ltd., has prepared a standard set containing a sample of nearly every crude drug—nearly 90—listed in the syllabus for the qualifying examination of the Pharmaceutical Society of Great Britain. Exceptions are those drugs covered by D.D. Regulations, essential and fixed oils, and a few that are at present unobtainable. Each specimen is supplied in a container, the label of which gives the official name, natural origin, family and geographical source. Only a limited number of the Pharmacognosy Recognition sets will be available owing to the amount of labour required to select and pack the specimens. A set is, however, being presented to each of the colleges recognised by the Pharmaceutical Society. The sets will be supplied to others at a nominal price of £2 2s.

VERMICULITE

Flexible Means of Insulation

THE obvious potentialities of vermiculite as a highly effective and relatively cheap insulating material find a practical application in the form of a new insulating brick, compounded of sand, ciment fondu and vermiculite. The patent for this brick, rectangular and tongued and grooved, has been taken out by a Wolverhampton firm (Reymor Brick Co., Ltd.) in collaboration with a gas engineer and is stated to have resulted, in its first uses, in heat conservation represented by fuel savings of up to 30 per cent.

Next to their marked insulating capacity, the chief merit of the new bricks is the ease with which they may be installed, by unskilled labour and without cement or mortar, or removed. The benefit of this is evident, in view of the need to preserve the accessibility of the kind of equipment for which they are chiefly required, heated solution tanks and the like. The loss of heat from such vessels, whether heated by gas burners or steam pipes, is a common phenomenon. Enveloping such tanks in ordinary brickwork has conspicuous disadvantages.

The bricks are soft enough to be cut or sawn with ease, yet tough enough to stand rough treatment. When assembled round a heated tank holes can easily be cut to admit gas pipes, injectors or other fittings, and to provide secondary air inlets and flue outlets. Special bricks are provided for corners, called long angle bricks and short angle bricks. These comprise two integral parts extending at right angles to each other, one part having a groove in its outer edge and the other a tongue, to key with the tongues and grooves of the bricks in the walls.

A practical example in an oil plant

Long and short cover bricks are provided to finish off the upper edges of the side walls, and to meet the surface of the tank to close in the combustion space These covering members are stepped to fit flush on to the bricks in the top course, and they are rounded on one upper edge to provide a neat finish. Some of the cover bricks are supplied mitred for use at corners.

Steam Control and Production Costs

A NEW 20-pp. booklet, *Steam Economy*, will be of interest to a large number of firms using steam for process and heating. It offers suggestions for improving the output economy of steam-heated plant.

At the beginning of the war, before the fuel efficiency campaign began, Spirex Manufacturing Co., Ltd., of Cheltenham, published its Bulletin No. 9 on "Fuel Economy," which was the forerunner of many publications on the subject as the campaign developed. Two years ago a further bulletin—No. 16, *Steam Economy*—made its appearance, of which the present issue is the latest revised edition. It is concise and eminently readable, with easy-to-follow diagrams. It confines itself to the simple ways in which users can get more value from their steam consumption, and the suggestions can, it is claimed, be commonly applied to all steam units.

Prominence is given to the need for more accurate measurement of steam consumption as a fundamental requirement of the costing system. This, states the company, is at the very root of production costs and economy. Attention is drawn to the value of an indicating steam meter on the steam supply to each main department, as well as at the boiler mains.

Emphasis is given to the new technique of "individual steam separation" (a small steam separator in front of each process unit) as an important element of efficient heat transfer methods.

Technical Publications

PROCEDURE for obtaining supplies and for effecting imports and exports of those materials for which the Board of Trade and Ministry of Supply are responsible, is contained in the new edition of the "Raw Materials Guide," November, 1949 (HMSO, 1s. 6d.). now available. The present Guide includes all the various alterations made since the beginning of February, 1948, and gives details of the relevant statutory orders or instruments in force at July 31, 1949. Alterations up to September 30, 1949, are included as addenda at the back of the volume. There is much useful information as to the nature, origin, and uses of the materials covered.

* * *

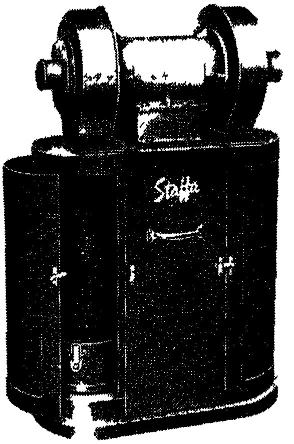
LATEST developments in precision electrical instruments are notified by Muirhead & Co., Ltd. Beckenham, Kent, by the issue, at frequent intervals, of a series of bulletins, of which three now available describe the Duddell type oscillograph employing an oil-damped bifilar suspension (B.641-A); inductance bridge giving the inductance in terms of an external capacitor standard (B.644-A); and a frequency bridge with variable dial (B.645-A).

* * *

A REPORT on investigations into a corrosion-resisting cast chromium-nickel steel, carried out in its metallurgical laboratory, forms the main article of the "Sulzer Technical Review" (No. 2), just published by Sulzer Bros. (London), Ltd. Other features cover diesel engines, pneumatic conveyors for the tobacco industry, and a general account (with drawings and photographs) of discharge regulation in piston-type compressors, and the suction valve regulating system developed by the company.

* * *

THE possibility of measuring microbiological degradation of cotton is experimentally demonstrated and a technique for assessing damage caused to cotton yarns by fungi under laboratory conditions is described in report No. 11, of the Selected Government Research Reports on "Textiles and their Testing," Vol. 4, now obtainable (HMSO, 6s. 5d., post paid). The volume contains 12 reports, six of which are devoted to the testing of fabrics for resistance to tearing, breaking and peeling. The durability of metal-plated fabric and the fire-proofing of cotton fabrics are each the subject of two reports.



[Courtesy, Chamberlain Industries, Ltd.

The D.E.4 twin portable dust extraction unit, a new design in this range of equipment, which employs two centrifugal suction paddle blade fans, powered by a totally enclosed, double spindle motor. It is suitable for attachment to existing grinding, polishing or buffing machines, etc. Provision is made for ducting to be readily connected to discharge the cleaned air to atmosphere outside the building

UNDER the revised title, "Water Pollution Abstracts," Nos. 1, 2, and 3 of Volume 22, prepared by the Water Pollution Research staff of the Department of Scientific and Industrial Research, have just been released. The abstracts, formerly entitled "Water Pollution Summary of Current Literature," are published monthly.

* * *

CHEMICAL accidents, their cause and prevention, form a section of a new pamphlet "Accidents, How They Happen and How to Prevent them," published for the factory Department, Ministry of Labour and National Service (HMSO, 9d.). Causes are divided into poisoning, fire, and explosion and typical examples are briefly cited relating to oxygen deficiency; housing of chemical plant containing toxic gases; handling of corrosive liquids; maintenance work on plant which has contained corrosive liquid; oxygen in confined spaces; soldering and cutting of oil and petrol drums; and sugar dust explosion.

LEAK DETECTION IN PNEUMATIC SYSTEMS

New Development Employs Tracer Gas

A TECHNIQUE which is new in this country has been evolved for the rapid and accurate location of leaks in aircraft and other pneumatic systems by the introduction of the type H leak detector, developed and manufactured by the British Thomson-Houston Co., Ltd., Rugby. With this, it is said, even the most complex systems can be tested with ease and certainty. The equipment should be of value to manufacturers of aircraft as well as to makers of all types of pneumatic equipment for aircraft and other purposes, and to all sections of the industry concerned with the maintenance of such systems.

The method employed in testing is to inject a small quantity of suitable "tracer gas"' into the air or gas in the system; any air escaping will then carry a small percentage of tracer gas with it. The leak detector is highly sensitive to the presence of the tracer gas and any leak, however small, can be readily detected.

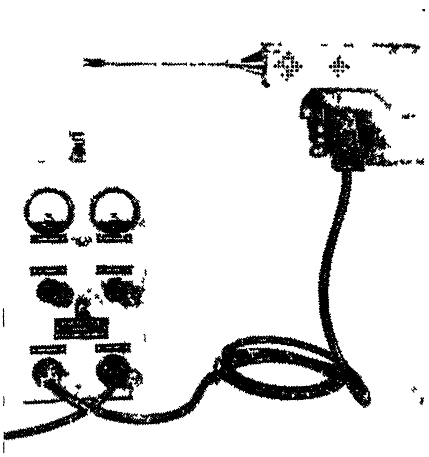
The instrument consists of a detector unit and a control unit. The detector is a hand-held probe with a convenient hand grip and a plastic-tipped metal nozzle. The unit contains an element sensitive to vapours of halogen compounds (those containing chlorine, bromine, iodine, and fluorine) and a motor-driven impeller which draws air through the element.

Audible and Visual Signals

A small loudspeaker built into the detector unit emits an audible clicking which, when the sensitive element detects the presence of vapour of a halogen compound, increases in frequency, giving an audible indication. A visual indication of a leak is given by an increase in the meter reading on the control unit. The instrument will operate from a 190- to 260-volt a.c. supply, the consumption being only 150 W.

The I.C.I. Arcton 6, which has no deleterious effects on components, is the tracer gas used. It is non-toxic, odourless, and can be liquefied at approximately 70 p.s.i. It can, therefore, be conveniently introduced into the system from small cylinders containing 1 to 2 oz. of liquid, giving a concentration at the full testing pressure of about 1 per cent.

The sensitivity of the instrument is such that leaks passing air at the rate of ½ c.c. per min., with a tracer concentration of 1 per cent or less, may be readily detected. In terms of a pneumatic system of total capacity 300 to 400 cu. in. operating at 1000 p.s.i., this corresponds to a fall in pressure of 2 p.s.i. per 24 hr. per leak.



The compact detector and control unit

It is preferable to inject the required quantity of tracer gas while the pneumatic system is at a reduced pressure, so that on charging to full working pressure the tracer gas is carried into the main reservoirs, thereby greatly accelerating the detection of any leaks. The nozzle of the detector unit is first directed into the main zones of possible leakage in the system, when indication of large leaks from points in these zones will immediately be given by the instrument.

After the correction of major leaks, a more detailed search at all joints will reveal even the smallest leaks, a period of approximately one sec. being sufficient at each point to check for leakage. This technique is applicable to either component, sub-assembly, final test or maintenance service.

It is necessary, in view of the sensitivity of the instrument, to rectify any large leaks before searching for small ones in the same zones, as the contamination of the ambient air in that area would make it difficult to locate accurately any minute leaks.

The leak detector is available commercially for all leak-testing applications.

The Chemist's Bookshelf

ORGANIC CHEMISTRY. G. Bryant Bachman. McGraw-Hill Book Company, Inc. New York, Toronto, London. 1949. Pp. 432. 36s. 6d.

Organic chemistry was until comparatively recently largely a mass of unrelated facts with here and there certain rules covering reactions of specific types. With the development of the electronic theory of organic reactions a systematic foundation for organic chemistry is appearing. Widely different reactions and structural transformations are found to be governed by the same simple laws, the course of many reactions can be predicted, and fresh methods of synthesis can be suggested.

This new volume in the International Chemical Series presents organic chemistry in the light of these modern concepts. Even before any classes of compounds have been separately considered and only the general classification and nomenclature of carbon compounds have been described in two short introductory chapters, the student is introduced to the two basic principles of the theory, (1) *In a given molecule reaction is most apt to occur at that bond possessing the maximum polarity*, and (2) *Those reactions are most apt to occur which lead to the maximum degree of polarity in the bonds formed.* It is shown by numerous examples how these can be applied to illuminate the behaviour of organic compounds and to predict accurately the products of the types of reactions that are most frequently encountered. Thus the student starts his reading of organic chemistry at a considerable advantage.

Similarly, a discussion of electronic resonance is introduced before the study of aromatic compounds in detail, and another basic principle, *viz.*, *Increased resonance always results in increased stability*, is explained at this stage so that the behaviour of benzene derivatives and other cyclic compounds shall be better understood.

The text is intended especially for "non-chemistry majors," *i.e.*, for those students who are taking chemistry as a subsidiary subject in their honours degree course. The field covered by this not very bulky volume is extensive. Indeed, scarcely any of the more specialised branches of the subject are omitted, and the industrial and biological aspects receive much attention. There are chapters on proteins, the chemistry of body processes, physiological action, and synthetic polymers. The treatment in places is scrappy, and methods and materials that have come into prominence within the last year or so are dealt with at greater length than many of those long established in organic chemistry. Nevertheless, the book provides an excellent survey of the whole.

The book is very readable and attractive, and is enlivened by many interesting ancillary remarks. There is a good index and there are useful lists of definitions. A selection of books for further reading is given, but no references to sources appear in the text.

PROCEEDINGS OF THE SECOND RUBBER TECHNOLOGY CONFERENCE. T. R. Dawson, C. M. Blow and G. Gee. Cambridge: W. Heffer & Sons, Ltd. Pp. 523. 63s.

The conference held under the auspices of the Institution of the Rubber Industry, June 23-25, 1948, is fully reported here. The war acted as a stimulus to research and development in the rubber industry such as it had never had before, but, equally, the need for secrecy suppressed from published literature much of the results of this work. A good deal of this information was disclosed at the international meeting now under review, at which 71 organisations, representing 15 countries, took part.

Following each of the 43 papers is a report of the discussion which took place. Noteworthy is the lecture by Shailer L. Bass on silicon rubber, as a new synthetic elastomer, the basic chemical of which is a silicon-to-oxygen linkage that has a bond strength one-and-a-half times as great as the carbon-to-carbon linkage of organic rubber. This, together with the lack of unsaturation in the polymer, makes possible a resilient material that stays elastic from −70° to 500°F., is resistant to weather, chemicals, and oils, and has good dielectric properties.

· PERSONAL ·

THE president of the Royal Society has appointed the following vice-presidents for the ensuing year: Sir Thomas Merton, treasurer of the Royal Society; Sir Edward Salisbury, biological secretary of the Royal Society; Sir David Brunt, physical secretary of the Royal Society; Prof. C. E. Tilley, professor of mineralogy and petrology in the University of Cambridge.

The National Coal Board has appointed Dr. William Reid to be deputy chairman of the Scottish Divisional Board in succession to Captain T. H. Thorneycroft, who recently resigned. Mr. H. R. King, a deputy production director of the Scottish Divisional Board, has been appointed to succeed Dr. Reid as director.

Among degrees conferred at the University of Edinburgh in December was that of Doctor of Philosophy, in the faculty of science, obtained by Mr. Leslie R. Currie. He has been studying the evolution of small-scale quantitative methods of analysis for tin and lead, with reference to the determination in non-ferrous alloys.

Mr. James D. Cunningham has been elected national president for 1950 of the American Society of Mechanical Engineers, of which he has been a member for nearly 30 years.

Mr. Sidney Abbey, of Edgerton Bank, Huddersfield, governing director of James Robinson and Co., Ltd., sulphur dyestuffs manufacturers, Hill House Lane, Huddersfield, who died on May 26, left £37,473 (£26,337 net).

The result of the ballot for the election of council members, which was announced at the recent annual general meeting of the British Engineers' Association, in London, was as follows:—Mr. W. K. G. Allen, Mr. A. H. Chilton. Retiring members re-elected: Mr. C. K. F. Hague, Sir Greville S. Maginness, Mr. Eric A. Robinson, Sir Basil R. G. Tangye, Mr. D. D. Walker, Mr. J. S. Woodrow.

Obituary

Mr. Evan Charles Evans, of West Kirby, whose death is reported, aged 69, was formerly technical director with Goodlass Wall and Co., Ltd., at Liverpool, with which he had been connected for 52 years.

Mr. Gerald Steel

Mr. Gerald Steel, at present joint managing director of the United Steel Companies, Ltd., becomes sole managing director on the chairman, Sir Walter Benton Jones, relinquishing the office of joint managing director on January 1, 1950.

Sir Steven Bilsland, chairman of the Scottish Council (Development and Industry), has accepted an invitation to be a director of the Dollar Exports Board.

New Chemical Department

SIR Robert Robinson, who opened on December 10 the new chemistry department at King's College, Newcastle-upon-Tyne (The Chemical Age, *61*, 831) points out that he was incorrectly reported as saying that a new compound could be obtained from urea and methyl alcohol. The two essential ingredients were, in fact, urea and paraffin oil; methyl alcohol functioned only to assist their combination.

Four Years' Diploma Course

Four years' study instead of three will be required in future for the diploma of the Royal Technical College, Glasgow, it was announced on November 26 by the director of the college, Dr. D. S. Anderson, at the annual presentation of awards. It has been evident for some time, he said, that the amount of work required for the diploma could not be satisfactorily covered in three years. The number of day and evening students was the highest in the history of the college.

HOME

Plastics Lecture

A lecture on "Plastics" illustrated by lantern slides and exhibits will be given by Mr. W. S. Dahl at the Borough of Wimbledon Public Library at 8 p.m. on Thursday next (December 29).

G.P.O. Staff Awards

During the quarter ended September 30, 1949, the G.P.O. awards committee gave prizes amounting to £552 for 250 suggestions made by Post Office staff for improving services. The rewards ranged from £1 to £30 for individual suggestions.

Scottish Coal Distillation "Uneconomic"

The Scottish Council (Development and Industry) has indicated that it regards proposals for coal distillation in Scotland as likely to be uneconomic at the present time. This report follows investigation by a sub-committee into the earlier proposals of the Scottish Reconstruction Committee urging the establishment of a distillation plant in Lanarkshire.

London SCI to Amend its Rules

A special meeting of the London Section of the Society of Chemical Industry is to be held on January 2 to discuss the adoption of amendments to the rules, which were drawn up in March, 1918, and have been amended only once since. The proposed alterations principally represent changes in the method of electing or re-electing officers, and bring it into line with common custom.

Trade Promotion in the U.S.A.

Mr. Neville Blond, United Kingdom Trade Adviser in the U.S.A., left for Britain last week-end, having completed the assignment which he undertook in May, 1948. The Office of the U.K. Trade Adviser in the U.S.A. will now be closed. The work is being undertaken regionally by the four Superintending Trade Consuls and their Commercial Advisers based on Consulates-General at New York, New Orleans, San Francisco, and Chicago.

U.S. Investment in Britain

An industrial guaranty contract has been concluded between the Export-Import Bank of Washington, D.C., acting as agent for ECA, and the Barber-Greene Company, Aurora, Illinois, under which the U.S. firm will help to increase British machinery output. The American company will invest $27,180 in its British subsidiary, Barber-Greene-Olding & Co. Ltd., which will be provided as additional working capital to make possible a larger volume of business.

Import of Agar-Agar

The Ministry of Food and the Board of Trade have agreed to facilitate the importation of a limited quantity of agar-agar from Japan under individual licence.

Double Fatality

Leonard Mansley, aged 24, and Thomas Towers, aged 35, both living at Connah's Quay, were killed at Hawarden Bridge Steelworks, Shotton, early on December 13. It is understood that a load of the steel sheets from an overhead conveyor fell on them.

Textile Institute Membership

During 1949 779 new members—more than in any previous year—were elected by the Textile Institute. Of these, more than 200 were under 25 years of age. Since January 1946, 2931 new members have joined the institute, of which the effective membership has increased by over 120 per cent to 4860.

Future of Sunderland Tar Works

It has been announced that the Northern Coal Board does not contemplate taking over the tar-distilling works at Sunderland which are to be vacated by Monsanto Chemicals, Ltd. Sir Mark Hodgson, chairman of the Northern Regional Board for Industry, stated that present distilling works in the area were able to cope with the demand. Efforts were being made to try and interest other firms in the site.

Aid for the Blind

The object of St. Dunstan's is to train a man so that he may go out into the world and take his place as far as possible as a normal worker. The organisation is still a voluntary one, without Government subsidy, and in view of high taxation, many subscribers make use of the covenant method of giving, which enables St. Dunstan's to receive nearly twice as much as is given. Details of this method are obtainable from 191 Marylebone Road, N.W.1.

Scientific Conversazione

A scientific conversazione was held at the Evans Biological Institute on December 14, attended by medical men, pharmacists, dentists, nurses, heads of schools and other professional people in the Runcorn area. Demonstrations were arranged in every department to show modern techniques and developments in medical, pharmaceutical and veterinary research. The Evans Scientific Society is composed of the graduate technical and research staff of Evans Medical Supplies, Ltd.

◆ OVERSEAS ◆

Trinidad Crude Oil

The Trinidad Petroleum Development Company reports that its crude oil output for November was 242,410 barrels.

More Uranium for Russia?

Discovery of new uranium deposits in Czechoslovakia has been reported by diplomatic officials in Washington, last week. It is understood that the uranium was sent in raw state to Russia.

Control of Opium Production

Four of the world's principal opium producing countries have agreed to limit official production of the drug to the quantity required for medical and scientific purposes. The countries are India, Persia, Turkey and Yugoslavia.

Belgian Oil Refinery Project

A modern refinery is to be constructed at Antwerp by the Esso Standard Raffinerie, a new company formed by the Standard Oil Co. Construction is expected to take three years, and kerosene, fuel oil, and diesel oil will be supplied to the company's Belgian associates.

Cheaper Fluorine Production

An electrolytic method of producing fluorine is reported to have been developed by E. I. Du Pont de Nemours & Co., as part of its programme of development and application of atomic energy. The new process is claimed to reduce the price of fluorine to $1 a pound.

Holland's New Synthetic Yarn

The A.K.U. (Algemeen Kunstzijde Unie), the Dutch rayon group, will begin next year the manufacture of a new type of nylon yarn which has been given the branded name Enkalon. The chemical composition and the properties of the new yarn are very similar to those of nylon. Most of the raw materials required are available in Holland. The company recently acquired certain patent rights from E. I. Du Pont de Nemours.

Lead and Zinc in French Morocco

A project is announced to develop the lead and zinc mines at Bou Beker in French Morocco with financial assistance from ECA under the Marshall plan. Annual production is expected to reach 85,000 tons of lead concentrate and 120,000 tons of zinc concentrate. This would provide over 70 per cent of France's future lead needs and about 50 per cent of her future zinc requirements.

Salt in S.W. Africa

Webster Marine Salts (Pty.), Ltd., a Cape Town enterprise, intends to exploit the Cape Cross, S.W. Africa, salt occurrencies, estimated at 23 million tons.

U.S. Copper Output Rise

Crude copper production in the U.S.A. in November was 80,778 tons, an increase of more than 11,000 tons over October, reports the Copper Institute. 92,688 tons of refined copper were produced, against 86,882 tons in the previous month.

Resistant Putties

According to reports from Eastern Germany, successful experiments have been carried out in the Buna Works for the manufacture of putties claimed to be resistant to both acids and alkalis. It is stated that the newly developed putties will resist temperatures up to 100°C.

Sandoz Department for Germany

The Sandoz A.G., Basle, Swiss manufacturers of chemicals, pharmaceuticals and dyestuffs, has decided to transfer part of its productive facilities to the vicinity of Lörrach, South Baden, Germany. Negotiations with the German authorities are stated to have been concluded. Construction of the works is to start soon.

More Swedish Iron and Steel

A report by the Swedish Association of Iron Works reveals that exports of iron-ore reached the very high level of 5,670,000 tons in the first six months of this year, an increase of 699,000 tons above the same period of 1948. Total exports of iron and steel increased from 61,000 tons to 74,800 tons. Iron prices on the Swedish market have declined recently by about 5 per cent.

U.S. Aluminium Output Lower

Production of primary aluminium in the U.S.A. in September again showed a decline. The output of 49,742 short tons was 4 per cent lower than the previous month and the lowest total since June, 1948. September was the first month in which the U.S.A. was a net exporter of aluminium in crude and semi-crude form.

Pitchblende Located in Colorado

A mining company official has reported in Denver (Colorado) that a 3600 ft. tunnel in the Rocky Mountains has pierced what may be an important " mother lode " of pitchblende—prime source of uranium. Plans are being made to fan out other tunnels to adjacent areas in a search for more deposits.

PARLIAMENTARY TOPICS

IN the course of a written answer to a question by Mr. A. R. Blackburn concerning research and development since the nationalisation of the coal, gas and electricity industries, the Minister of Fuel (Mr. H. Gaitskell) stated that the National Coal Board had set up its own central research establishment. The Board was co-operating with other research organisations including the Safety in Mines Research Organisation, the Fuel Research Station and the Pneumoconiosis Research Unit; and supported by the British Coal Utilisation Research Association, the Coal Tar Research Association, and the British Coke Research Association. The Gas Council had not yet decided its future organisation of research, but was in the meantime supporting the Gas Research Board. Research and development on a number of projects—such as underground gasification—was being undertaken by his department, such work being directed by the Chief Scientist. A scientific advisory council had also been established to advise on research programmes of the nationalised fuel industries.

IN a later discussion of technical problems arising from the changes in the programme of dismantling in Germany, the Under-Secretary for State for Foreign Affairs (Mr. C. P. Mayhew), replying to Mr. T. C. Skeffington-Lodge regarding synthetic oil plants, emphasised that it was the responsibility of the Military Security Board to ensure that no prohibited items were produced. Equipment at plants dismantled by November 24 was to be removed. The only technical problem was that of the August Thyssen works at Hamborn, and this was now being considered by experts.

Easing Oil and Fat Controls

The Oils and Fats (No. 2) Order, 1949, which comes into force on January 1, 1950, revokes the previous Order and includes the following amendments. Licences are no longer needed for the manufacture or sale by wholesale of certain edible animal fats, oleo oil or technical tallow, but all except the last remain subject to allocation on permit; licences are no longer needed for the sale by wholesale of rape seed oil; maximum price restrictions on sales of home produced technical tallows are removed.

THE DICTATORIAL METHOD

MR. HERBERT MORRISON and other Ministers were vigorously attacked by Sir Ernest Benn last week when the latter claimed that Britain was nearing the end of the blackest five years of its history.

Sir Ernest, who was speaking at the annual meeting of the Society for Individual Freedom, of which he is president, said that Mr. Morrison refused to discuss with the electors such matters as the groundnuts scheme and devaluation. He exhibited to the public what he called a "free Parliamentary democracy," which really meant that it was improper for anyone to make a suggestion, unless it agreed with Mr. Morrison's own views.

In 1945, the Lord President of the Council said that the cost of liberty would involve the sacrifice of some personal freedom. But it was hard to find to-day any personal freedom to sacrifice.

The business classes were already confined by every restraint that any Government could devise—and they were now pilloried as a sort of upper-middle class and threatened that unless they did their duty something else would happen.

Manufacturers were repeatedly told they must increase dollar exports and they were pleased to do so with the greatest possible speed. But a satisfactory flow of goods could not be obtained while exporters' hands were tied.

German-American Collaboration

THE Geary Chemical Corporation and the Pittsburgh Coke and Chemical Company are to form a jointly-owned subsidiary company to produce and market certain new insecticides which have been developed by the West German chemical company Farbenfabriken Bayer.

These insecticides are to be made available for manufacture and distribution in the U.S.A. under the terms of a contract between Bayer and the Geary Chemical Corporation and approved both by the American and British occupation authorities in Western Germany. The agreement with Bayer provides that Bayer will make available to the G.E.C. current and future scientific and manufacturing discoveries in the agricultural and chemical field, as developed in the Bayer laboratories at Leverkusen and Elberfeld. The joint subsidiary to be formed by Pittsburgh Coke and Chemical and G.E.C. will be licensed to manufacture and market some of these. There will be reciprocal exchanges of related technical and scientific information.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Manchester Oil Refinery, Ltd., London, W. (M., 24/12/49.) November 18, charge (subject to, etc.) securing to District Bank, Ltd., all moneys due or to become due from the company to the Bank secured by a mortgage and debenture dated April 4, 1949; charged on certain lands at Barton-upon-Irwell, Davyhulme, together with the buildings, fixed plant, machinery, etc., thereon, and the benefit of covenants, agreements, etc., in the charge mentioned but subject as therein mentioned. *£650,000. June 28, 1949.

Satisfactions

British Celanese, Ltd., London, W. (M.S., 24/12/49.) Satisfaction November 25, of debenture stock and supplemental deed, respectively registered October 2, 1943, and November 8, 1944, to the extent of £1000.

Carbometals, Ltd., London, E.C. (M.S. 24/12/49.) Satisfaction November 24, of debenture registered September 3, 1945.

East Anglia Chemical Co., Ltd., Darlington. (M.S., 24/12/49.) Satisfaction November 23, £12,000, registered April 6, 1949.

Statutory Winding-Up

The statutory winding up of the Pharmaceutical and Allied Chemicals Association, Ltd., was formally completed at its general meeting, held at 166 Piccadilly, London, W.1, on November 23, after the liquidator's statement of account was presented.

Increases of Capital

The following increases in capital have been announced: Aerite, Ltd., from £2000 to £3000: British General Manufacturing Co., Ltd., from £5000 to £9500; F. W. Hampshire & Co., Ltd., from £156,250 to £318,750.

Company News

The following dividends have been announced by Powell Duffryn, Ltd.: Interim dividend of 3 per cent actual (less income tax) on the £9,660,471 ordinary stock, for the year ending March 31, 1950. Dividend of $2\frac{3}{8}$ per cent actual (less income tax) on the £3.6 million $4\frac{1}{4}$ per cent cumulative preference stock for the half year to December 31, 1949.

Evans Medical Supplies

Evans Medical Supplies, Ltd., will pay today a dividend of 6 per cent, less tax, on the preference stock for the 12 months ending December 31, 1949.

The Distillers Co., Ltd.

The directors of The Distillers Co., Ltd., have declared an interim dividend on the ordinary stock for the year ending March 31, 1950, at 2 2/5d. per unit of 4s., less tax, payable February 28, 1950.

Dorman Long & Co.

The start of the second stage of Dorman Long & Company's major development plan was announced by Sir Ellis Hunter at the company's 60th ordinary general meeting in London on December 15. Over £8 million will be spent on an open hearth steel plant on the Lackenby site with a capacity of 100,000 ingot tons per week, new blast-furnace ancillary equipment and the extension of ore grading plant. The work may be completed by 1952. The Government has refused to agree to the segregation of the company's engineering interests in the event of nationalisation.

New Registrations

Brixley Trading Co., Ltd.

Private company. (476,981.) Capital: £500. Manufacturers of chemicals, gases. Directors: F. G. Sterne, A. A. Kalmus. Reg. office: 33 Mortimer Market, Tottenham Court Road, W.C.1.

D. F. Evans-Hemming & Partners, Ltd.

Private company. (476,022). Capital: £500. Advisers and consultants on all matters relating to management, chemistry, electrical, chemical, heating, ventilating, engineering, horticulture, etc. Directors: Dr. F. Riesenfeld, Douglas F. Evans-Hemming and L. Evans-Hemming and Dr. L. Riesenfeld. Registered office: 42 Monohan Avenue, Purley, Surrey.

The Stock and Chemical Markets

DESPITE less business, stock markets have been firm, industrial shares showing moderate gains over a wide front, regardless of uncertainty in British Funds, which reflected some selling of long-dated stocks. The better trend in industrials was attributed to the view that exporting companies have good prospects of maintaining dividend payments in 1950, and that in most cases yields are not unattractive.

Chemical and kindred shares reflected the better trend, Imperial Chemical improving to 43s. 3d., at which there is a yield of nearly 4⅝ per cent on the basis of last year's 10 per cent dividend. Monsanto 5s. ordinary were 50s., Fisons changed hands at 27s. 6d., and Laporte Chemicals 5s. ordinary at 9s. 6d. Albright & Wilsons were 29s. 6d., Brotherton 10s. shares 19s. 4½d., Amber Chemical 2s. shares 4s. 9d. and British Glues & Chemicals 4s. shares 18s. 6d. Elsewhere, Borax Consolidated have been firm at 58s. 3d., the market continuing to expect the dividend to be maintained.

Turner & Newall at 74s. 9d. turned easier owing to the lower profits shown by the results, although the 15 per cent dividend is maintained with ease and a large proportion of the group's profits again placed to reserves. Amalgamated Metal shares strengthened to 18s. and there was a better tendency in shares of companies concerned with plastics, British Xylonite being 60s., De la Rue 23s. 6d. and British Industrial Plastics 4s. 9d. Elsewhere, British Aluminium at 41s. have been steady and there was demand for Lever & Unilever, which strengthened to 41s. 6d. Glaxo Laboratories rose further to £23 and United Molasses have been prominent with a rise to 41s. 9d. The 4s. units of the Distillers Co. continued to change hands around 18s. Dunlop Rubber were better at 62s. 9d. and British Oxygen, at 90s. 3d., were unaffected by news of the company's South African subsidiary. Triplex Glass (18s.) have held their recent improvement.

Iron and steel shares attracted more attention. Current market prices are well below the scheduled take-over valuations, in the event of nationalisation. United Steel have firmed up to 28s. 1½d., Stewarts & Lloyds to 53s. 3d. and Colvilles to 35s. 9d. Despite the Government's decision not to allow the company to segregate its bridge building and engineering assets, Dorman Long, at 31s. 9d., were also better on balance. Elsewhere, Guest Keen have moved higher to 42s. and T. W. Ward to 56s. General Refractories were firm at 22s. 1½d. and Babcock & Wilcox 60s. 9d.

Boots Drug at 50s. have been active, Beechams deferred were 15s., Griffiths Hughes 21s. 4½d., Sangers 22s. 9d. and British Drug 5s. shares 6s. 6d. Associated Cement further strengthened to 77s. and British Plaster Board 5s. shares were firm at 13s. 9d. Oils have been more active, with Apex (Trinidad) touching 40s. on the financial results.

Market Reports

FIRM price conditions and no outstanding features are reflected in the various sections of the industrial chemicals market. Quotations for home continue at recent levels and little information is available of price adjustments for new contract business; some increases are expected due to the higher cost of raw materials and transport. The general improvement in supply has facilitated contract replacement business and there is a good call from the textile and plastics industries. There is no sign of any lessening in the volume of inquiry for export and a steady flow of bookings for Empire destinations has been maintained. Conditions for coal tar products are unaltered.

MANCHESTER.—Trading in most sections of the Manchester chemical market has disclosed few new bookings and has been quiet, both in regard to the home trade and to shipping business. This, the usual experience at this time of the year, applies to light and heavy chemicals as well as to the general run of fertiliser materials and to the tar products. However, deliveries into actual consumption against contracts have been maintained fairly well, though, here, also, the closing days of the present week were expected to bring about the usual sharp decline, with little prospect of improvement until several days after the holiday.

GLASGOW.—The recent volume of business transacted in the Scottish chemical market has again been slightly above average for the time of the year although it is not believed that consumption has been increased. A slight recession in the volume of business is anticipated in January. The xylol position continues unchanged, supplies being very difficult to obtain. The export market has again been quiet.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method of and means for the purification and revivification of acid pickling liquors for iron and steel products.—N. Swindin. May 9 1946. 631,525.

Synthetic resins.—E. I. Du Pont de Nemours & Co., D. D. Coffman, and H. W. Jacobson. May 24 1946. 631,590.

Synthesis of aldehydes and other organic oxygen-containing compounds.—E. I. Du Pont de Nemours & Co. June 7 1945. 631,316.

Apparatus for raising natural oils and other liquids by gaseous pressure.—Indo-Burma Petroleum Co., Ltd., N.F.B., Displacement Pump Co., Ltd., and N. F. Brown. July 4 1946. 631,317.

Pesticidal compositions.—B. F. Goodrich Co. July 31 1945. 631,318.

Emulsions of siccative or semi-siccative oils.—Soc. l'Impregnation Soc. A.R.L. Jan. 25 1946. 631,527.

Process for the catalytic synthesis of hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.). Aug. 6 1946. 631,457.

Production of gaseous and liquid fuels from carbonaceous materials.—J. C. Arnold. (Standard Oil Development Co.). Aug. 6 1946. 631,319.

Catalytic synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Aug. 23 1946. 631,322.

Apparatus for polaragraphic analysis.—J. E. B. Randles, and L. Airey. Sept. 5 1946. 631,459.

Manufacture of hydrocarbons.—Koppers Co., Inc. March 9 1946. 631,325.

Acrylamide and method of producing same.—American Cyanamid Co. Nov. 8 1945. 631,592.

Pump for operation with liquids having poor lubricating properties. — Dowty Equipment, Ltd., and F. H. Carey. Sept. 28 1946. 631,593.

Method of making alkali metal selenides. —California Research Corporation. Dec. 31 1945. 631,464.

Process and apparatus for the manufacture of nitrogen trichloride.—N.V. De Korenschoofe. Feb. 28 1946. 631,327.

Process for the electrolytic oxidation of aluminium and its alloys by means of alternating-current.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Dec. 19 1945. 631,467.

Process for the manufacture of chromium salts, and pure chromium.—P. Guareschi. Jan. 16 1946. 631,334.

Copolymers of styrene.—Standard Telephones & Cables, Ltd. Feb. 15 1946. 631,341.

Distillation furnaces.—Soc. Anon. Forni Ed Impianti Industriali Ingg. De Bartolomeis. Nov. 27 1941. 631,531.

Heat treatment of metal articles.—British Oxygen Co., Ltd., and R. E. W. Hobling. Feb. 21 1947. 631,396.

Manufacture of glass filaments.—Fibreglass, Ltd., A. De Dani, and R. W. Crosbie. Feb. 22 1947. 631,608.

Moulding compositions.—Dow Chemical Co. March 9 1946. 631,477.

Means for controlling and adjusting the level of liquids in containers.—G. Adlam & Sons, Ltd., and K. F. M. Friendship. March 11 1947. 631,610.

Process for producing a synthetic resinous coating composition. — Monsanto Chemical Co. March 29 1946. 631,479.

Method of purifying solutions of antibacterially active substances derived from the growth of micro-organisms.—K. Abildgaard-Elling [trading as Lovens Kemiske Fabrik Ved. A. Kongsted.]. July 12 1945. 631,349.

Manufacture of solid smokeless fuel.—Standard Oil Development Co Aug. 15 1946. 631,355.

Salt glazing apparatus.—Ferro Enamel Corporation. May 4 1946. 631,613.

Manufacture of pentaenes.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.). May 6 1947. 631,533.

Device for vaporising materials.—D. E. Pearsall. May 25 1946. 631,487.

Polarograph.—Distillers Co., Ltd., and W. S. D. Wise. May 30 1947. 631,403.

Production of transparent synthetic resins.—Shell Refining & Marketing Co., Ltd., P. J. Garner, and R. E. Bowman. June 4 1947. 631,365.

Amidation of esters.—Lankro Chemicals, Ltd., and E. M. Meade. June 9 1947. 631,367.

Ferrous alloy.—Coast Metals, Inc. Feb. 9 1945. 631,492.

Preparation of organo-siloxane polymers.—Dow Chemical Co. July 8 1946. 631,493.

Preparation of 2-amino-4-hydroxy-6-substituted pteridines.—American Cyanamid Co. July 27 1946. 631.494.

Process for the manufacture of organosilicon compounds.—Dow Corning Corporation, and J. T. Goodwin, Jun. July 1 1947. 631,619.

Aluminium phosphate phosphor.—British Thomson-Houston Co., Ltd. July 15 1946. 631,415.

Protective coatings of polyvinyl resin.—Bakelite, Ltd., C. E. Scoffom, and J. G. Weighall. July 24 1947. 631,372.

Process of preparing hemostatic compositions.—Soc. De l'Institut De Serotherapie Hemopoietique. Feb. 4 1946. 631,502.

Soap compositions.—Lever Bros. & Unilever, Ltd. Sept. 16 1946. 631,421.

Manufacture of synthetic resins.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 631,536.

Ceramic dielectric compositions and methods of regulating the dielectric properties thereof.—C. E. Every. (Titanium Alloy Manufacturing Co.). Aug. 27 1947. 631,436.

Dispersions of fluorine-containing polymers.—E. I. Du Pont de Nemours & Co. Sept. 5 1946. 631,504.

Production of organosilicon compounds.—Dow Corning Corporation. Nov. 25 1946. 631,506.

Processes for the preparation of streptomycin.—Distillers Co., Ltd., and P. D. Coppock. Sept. 19 1947. 631,507.

Interpolymers of a styrene, an allylic fumarate and an allylic alcohol.—United States Rubber Co. Dec. 10 1946. 631,514.

Manufacture of compounds containing phosphorus having insecticidal properties. Pest Control, Ltd., D. W. Pound, and B. C. Saunders. Oct. 17 1947. 631,549.

Carbonisation processes.—I.C.I., Ltd., and F. G. Audas. Oct. 20 1947. 631,551.

Suspensions of tetrafluoroethylene polymers.—E. I. Du Pont de Nemours & Co. Nov. 30 1946. 631,570.

Process for the manufacture of a pteridine derivative.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.). Dec. 19 1947. 631,516.

Production of phenanthridine compounds.—May & Baker, Ltd., H. J. Barber, S. J. Holt, and W. R. Wragg. Dec. 24 1947. 631,651.

Production of hypochlorous acid gas.—J. Noel-Davies. March 12 1946. 631,796.

Method for alkylating-benzene.—Compagnie Française de Raffinage. Dec. 18 1943. 631,874.

Process for fritting of articles consisting essentially of a hard carbide such as tungsten carbide.—Regie Nationale des Usines Renault. May 17 1940. 631,666.

Apparatus for weighing a continuous stream of material during flow.—Buhler Bros. Aug. 6 1945. 631,802.

Forming protective coatings on metal articles.—H. M. Freud. Aug. 7 1945. 631,667.

Process for the recovery of water-soluble plant substances such as ascorbic acid and also fat soluble vitamins, provitamins and other non-saponifiable constituents from chlorophyll-containing parts of vegetable materials.—A. Heilmann. Aug. 24 1945. 631,731.

Production of organic chlorine compounds.—Dominion Tar & Chemical Co., Ltd. March 27 1945. 631,669.

1-Substituted-3-cyanoguanidines and 1, 5 substituted biguanides and method of preparing same.—American Cyanamid Co. Sept. 11 1945. 631,878.

Process of and apparatus for producing carbon black.—Phillips Petroleum Co. Nov. 6 1944. 631,736.

Preparation of amphoteric amides of acrylic acid and their polymers.—General Aniline & Film Corporation. Oct. 16 1945. 631,738.

Means for use in sealing air or gas passages and/or ducts.—Air Control Installations, Ltd. Oct. 3 1946. 631,957.

Pigment-dyeing of fabrics.—Interchemical Corporation. Nov. 9 1945. 631,882.

Growing crystals.—Brush Development Co. Nov. 10 1945. 631,670.

Separation of organic nitrogen compounds.—I.C.I., Ltd., and W. Tyerman. Nov. 29 1946. 631,672.

Process for the manufacture of artificial carbon bodies.—Soc. Anon. pour l'Industrie de l'Aluminium. Dec. 28 1945. 631,813.

Manufacture of tetryl.—Olin Industries, Inc. March 31 1943. 631,814.

Apparatus for vulcanising rubber.—Dunlop Rubber Co., Ltd., and T. J. R. Dibdin. Feb. 11 1947. 631,888.

Process for the synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Feb. 28 1947. 631,682.

Preparation of piperazine mono carboxamides.—American Cyanamid Co. April 12 1946. 631,685.

Protection of magnesium and magnesium base alloys against corrosion.—Magnesium Elektron, Ltd., S. E. Mayer, and W. F. Higgins. April 3 1947. 631,686.

Process and apparatus for treating electrolytically-tinned ferrous metal strip.—Carnegie Illinois Steel Corporation. April 23 1946. 631,687.

Alkyl and di-alkylamino-alkyl and analogous pyridazones.—Sir W. N. Haworth, and L. F. Wiggins. April 11 1947. 631,755.

Method of preparing triacylmelamines.—Monsanto Chemical Co. Nov. 27 1946. 631,757.

Thermochemically removing metal from metals and alloys.—Linde Air Products Co. May 16 1946. 631,689.

Method of and apparatus for recovering liquid from a filter system.—Prosperity Co., Inc. Aug. 19 1939. 631,828

Colouring of oxide-coated aluminium and aluminium alloy articles—Aluminum Co. of America. June 27 1940. 631,829.

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Oxazoles and cyanine dyestuffs and photographic emulsions containing such dyestuffs.—E. I. Du Pont de Nemours & Co. Aug. 21 1946. 631,848.

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Halogenation of aromatic hydrocarbons.—Lummus Co. June 22 1942. 632,144.

Methods of dehydrogenating aliphatic hydrocarbons.—Koppers Co., Inc. Dec. 31 1943. 632,291.

Method and plants for obtaining precipitates easy to separate from the liquid medium.—J. C. Seailles. Sept. 20 1943. 632,076.

Pesticides.—B. F. Goodrich Co. April 2 1945. 632,151.

Carbonisation of coal.—Institute of Gas Technology. June 7 1945. 632,155.

Extraction of alumina from raw calcium aluminates.—Soc. Des Cimento Français. May 6 1942. 632,079.

Gelatin compositions of increased viscosity.—General Aniline & Film Corporation. Nov. 24 1945. 632,174.

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Heterocyclic sulphur compounds and process for preparing same.—Texaco Development Corporation. Nov. 21 1945. 632,306

Aspirators for the sampling or testing of gases. L. T. Minchin. Nov. 15 1946. 632,179.

Process for the preparation of solutions containing sodium hydroxide. — N.V. Koninklijke Nederlandsche Zoutindustrie. Aug. 3 1945. 632,081.

Catalytic reactions.—Baker & Co., Inc. Dec. 10 1945. 63,2182.

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A Chemical Progress Report

IN broad terms a great deal has been said and written about the post-war expansion of chemical industry. The recently published annual report on the Progress of Applied Chemistry (Society of Chemical Industry) provides detailed and panoramic evidence. Admittedly it covers a year that already seems politically and economically distant, 1948; but even this time-gap cannot reduce the instant impression of size and variety, of quantity and quality, which is given by this 742-page volume. The vastness of the chemical industry, the utter impossibility for any one man to achieve an intimacy with more than one or two branches of it, the extension of chemical ideas into fields that many would not think chemical at all, these are impressions that follow inevitably from a random scanning of the 30 main sections. Nor is the total picture static. It is a film rather than a photograph album. Few of the developments reported are completed tasks: almost all the journeys that chemists are making are much nearer their beginnings than their endings.

It would not be logical to argue that 1948 was a year of exceptional activity merely because this survey is bigger than similar surveys for other years. One plain and simple fact is that the Society of Chemical Industry received a better allocation of paper and was therefore able to offer more space to its reporters. 1948 is more accurately assessed as the first year of this century's forties which the society has been able to survey with adequacy; although, in saying this, it is not doubted that more than a few of the reporters themselves will disagree sharply, for there is plenty of evidence to show that they still have to leave out as much as they manage to include. However, it is not suggested that these annual reports should ever be exhaustively complete. Within sensible limits it is a good thing that the specialist reporter should feel some sense of restriction. The dangers of selectivity are less than the dangers of repletion and incomprehensibility. The opening sentences from the section on insecticides may well be quoted: "For this report certain topics have been selected from among the great number available. The topics selected appear either to be applications of general interest or work of fundamental importance."

So long as expansion continues, there is surely no better policy for any attempt to survey progress in a branch

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of knowledge. Again one may usefully quote from Professor Pollard's introduction to the agricultural section: "Space restrictions and the irregular, though improving, flow of scientific literature, in themselves prevent justice being done to more than a limited number of topics. In dealing with these, too, reference has perforce been made to communications appearing, in some cases, several years before that period strictly under review. Only in this way can current research be placed in its true perspective."

For the reader who wants to know "how things are going" in this or that branch of applied chemistry these principles are sound and practical. In the coldest sense, of course, science must shun the human element, and a selective method of reporting brings in that potential source of bias. But how much more indigestible is the alternative, a monotonous procession of over-brief descriptions of all relevant communications, the important and the trivial alike! The reader who desires this fullsome diet must rely instead upon the regularly published abstracts, and he has, after all, several series from which to choose.

Brevity has long been the soul of wit, and one must recognise that henceforward in the sciences selectivity is the soul of comprehension. A recent report on scientific man-power assumed that scientists had a working life of approximately 30 years. This figure may have been a weighted average to some extent, but it is fair enough as a rough assumption. How much of the entire picture, even in his own field, can a man hope to keep in focus and perspective during 30 years? One must allow the annual reporters to be guides and leaders, and discourage them from feeling guilty or apologetic for not being able to act as cataloguers.

A development that seems most praiseworthy, and which minimises the dangers of bias in selective reporting, is the writing of sectional reports by groups of specialists. Thus, the section on agriculture and horticulture has been prepared by the society's agricultural group with sub-sections on soils, fertilisers, crops, horticulture, the application of insecticides and fungicides, the control of nematodes, analysis of materials, animal nutrition, and veterinary medicines, each entrusted to different specialists. Similarly the section on resins, drying oils, varnishes, and paints has been

(continued on page 910)

Notes and Comments

Dollars and Chemicals

EXPORT and import accounts, of which the November totals have just been rendered by the Board of Trade, preserve a peculiar interest as portents of the ultimate results of a direct kind of the devaluation policy. Most of the evidence, however, fails to present any very clear picture of drastic changes in the channels of trade. United Kingdom purchases of chemicals of all kinds in November (£2.064 million) and sales (£6.893 million) do not represent very marked departures from the October level, and the record of exchanges with the U.S.A. is not greatly revealing, although the November aggregates show that exports to the U.S.A. were doubled in value (£266,671), while imports (£564,351) were about £90,000 less than in November, 1948. The cost of maintaining supplies of some essential American materials is typified by the figures for carbon black, 72,025 cwt. of which required £302,428 in November, while a year ago 86,760 cwt. was purchased for £245,329. Borax, on the other hand, is shown to have cost proportionally no more in November than it did 12 months before. That single piece of evidence, however, is certainly no assurance that the import value of this and possibly several other chemicals of American origin has not changed substantially since them.

Accident Review

SEEKING to isolate a source common to most industrial accidents is an unrewarding task. How many and various are the routes by which industrial mishap, injury and sometimes disaster can be created in works using or processing some chemical substances and molten metals is made very clear in the current report of the Chief Inspector of Factories. The fact that the year dealt with is 1948 does not in any way invalidate the salutary effect of the warning note. Although comparative figures of accident occurrences convey no accurate picture between one year and another, it is clear that 1948 was far from being a black year in the accident records and that managements as a whole have been leaders in promoting measures to minimise risks. A good deal more could have been done if authority to rebuild could be more readily obtained. Although there is no common factor, it is clear that most of the accidents, particularly with compressed gases, were rendered more or less inevitable by sudden unforeseeable lapses of workers. The inadvertent substitution of an acetylene or oxygen cylinder, when the intention was to provide an inert atmosphere of nitrogen gas, will always be potentially a short cut to serious trouble. That, however, is the sort of thing which is always capable of occurring, and does. To prevent it, managements will need to tackle a thing much more intractable than bricks and mortar—the human capacity to drift into slovenliness and absent mindedness, when long uneventful operation has put caution to sleep.

Risks and Penalties

THE picture the report presents tends to be confused by the classification of some groups of widely separated industrial activities under the heading of "hot and corrosive substances"—they were responsible for 8038 accidents last year, 315 fewer than in 1947, and only 1843 were attributed to corrosive chemicals. Passages in this report clearly suggest that the trouble experienced with corrosive substances could be minimised by two factors: the wider adoption of the safer new mechanical systems for decanting, transport, etc., and the more frequent substitution of innocuous materials which, it is suggested, might serve some processes as well as concentrated acid or alkali. Apart from this, there is no suggestion in the national survey of accident causes that managements have been neglectful, although there is thought to be further scope for the employment of foolproof systems of sampling, temperature reading, etc. In 1948, as in every year, the need to inculcate "safety mindedness" in workpeople and actively prevent, by propaganda and penalties if necessary, the unthinking improvisations which often end disastrously is driven home with undiminished force. Readiness to take some risks is one of those enduring and attractive human attributes for which, however, there is no room in modern chemical processes.

France's Coal

LES Charbonnages de France, the French equivalent of the British National Coal Board, has recently published—very belatedly—its provisional report for the year 1948. However, as a sort of apology perhaps for the tardiness of its arrival, the report includes production figures for the first nine months of 1949, which bear favourable comparison with 1929 on quantity alone, in addition to which one has to take into the reckoning the fact that in the latter year there were some 209,000 workers with no paid holidays, against the considerably less number of 190,500 in September 1949 with some paid-for holidays. France's coal production—never approaching anything like adequacy for her domestic requirements—amounted to 39.5 million tons (equivalent to an annual rate of 54 million tons) in the January to September period this year, which very nearly approaches her peak output of 55 million tons reached in 1929. The promising production figures are interesting, bearing in mind that France's coal mining operations are almost entirely nationalised; Les Charbonnages de France accounted for a total production of 43,560,000 tons in 1948 out of the country's aggregate output of 45,130,000 tons. Productivity per miner in 1948 increased by 17 per cent, which compares with a very fluctuating position in this country as regards output per man. There was also a notable decrease in absenteeism, from an average of 30.27 per cent in 1948 to 13.77 per cent in September 1949. It seems that France will always need a considerable import of coal to satisfy her domestic needs, but she appears to be doing something herself towards an improvement in the general situation. In this connection it is noteworthy that Britain exported to France in the first nine months of this year 1,093,772 tons of coal, and by November's addition this figure was increased to 1,378,834 tons.

A CHEMICAL PROGRESS REPORT

(*continued from page* 898)

produced by specialists from the Oil and Colour Chemists' Association; and plastics is a subject dealt with by the society's plastics group.

In these sections readers will certainly find some degree of overlapping between the sub-sections, but this a wholesome safeguard against the risk of bias and selectivity. Some other sections, quite as broad as those which groups have covered, have been compiled by one writer only. However authoritative an individual may be, the group method will continue to be preferable, and one would like to see this technique used much more often in future annual reports of the Society of Chemical Industry. It is an innovation most admirably suited to our times. Moreover, it spreads the load, for there can be little doubt that the preparation of this kind of report is a labour of professional love, and there are few scientists today who are not overworked.

There is reason to believe that the annual report for 1949, already being written while the 1948 volume is just being digested, will be enlarged again. Members of scientific societies are well aware of the rising costs of publications, but they can certainly take comfort in the realisation that the quality of publications is also rising.

DISPERSING I.G. FARBEN

Three Zonal Units?

THE decision, made originally by the old quadripartite control in Germany, to break up I.G. Farben is to be enforced by legislation which will be set up early in 1950 by the Allied High Commission. This was revealed by Mr. John McCloy, U.S. High Commissioner, at a Press conference in Frankfurt last week.

Since existing legislation on that subject was on the bipartite level, it would have to be harmonised with the French laws, said Mr. McCloy. The Allies were firm in their intention to eliminate all concentrations of economic power, but they " would not be unmindful of the claims of creditors and shareholders as far as that was compatible with this aim."

A memorandum had recently been submitted to the Federal Government by the " Protective Association of Security Holders," an organisation which claims to represent one-third of the shareholders of I.G. Farben. This asked for the early breaking up of the latter into three units—one in each zone—large enough for effective operations; the right of the old shareholders to exchange their shares against those of different companies; and the re-admission of I.G. Farben shares to the Stock Exchange.

According to an official of the bipartite I.G. Farben control office, states a report in *The Financial Times*, one of the obstacles in splitting up the trust would be the sales organisations abroad, which could only be dissolved if the Governments concerned co-operated.

China's Magnetite-Ilmenite

FOLLOWING three years of work, the Metallurgical Research Institute of the Enterprise Department of the North China People's Government has succeeded in extracting and refining locally occurring vanadium-bearing magnetite-ilmenite. The magnetite-ilmenite in the Tamiao and Heishan districts of Luanp'ing hsien, Jehol Province, is the only source yet discovered in China. The exploitation dates from the Japanese occupation of the territory in 1937. A plant was later built in Chinchow, especially for refining vanadium ore, but on the eve of V.J.-Day, Japanese engineers burned all the records of their technical research. Preliminary estimates place the deposits at about 2 million tons. The ore is estimated to contain 55 per cent iron, 14 per cent magnetite-ilmenite. and 0.3 per cent vanadium.

PETROLEUM AND COPPER

Dollar Aid in November

FOR the purchase of fuel, machinery, food and raw materials in the U.S.A. and dollar account countries, the United Kingdom and Western Europe received more dollars in Marshall aid in November ($240.5 million) than in any other month in 1949.

Among the major items for Britain in that month, for which Marshall aid was authorised, were: petroleum $32 million, copper $24.4 million, and machinery $22.9 million.

The announcement of these figures last week by the ECA Mission to the U.K. almost coincided with the Government's statement that, in view of Britain's dollar deficit, oil importers in 1950 will be required to absorb any available surplus in this country before drawing supplies from dollar sources.

Britain's share of Marshall aid, states the ECA Mission, comprised in November nearly half of the total of all countries participating in ERP. Purchase authorisations for the whole of Western Europe included petroleum products to the value of $56.6 million, non-ferrous metals and products $47.1 million, of which the major item was $24.4 million for copper and copper products for Britain.

Glass Enterprise in Jugoslavia

GLASS manufacture in Jugoslavia, revived and enlarged since the war, is likely to become one of the country's major industries.

Increased production, which has followed nationalisation, is reported in Jugoslavia to have been steadily maintained; by the end of 1951 output is expected to reach 50 million sq. ft. of flat glass and 30,000 tons of blown glass. Included among a number of new products are heat-resistant glass for laboratory purposes, lenses, glass wool, laminated glass, ampoules, glass tubes, vacuum flasks, electric bulbs, and glass jewellery.

A Federal Glass Institute was recently formed by the Government. Construction of a modern plant for the manufacture of blown glass is reported from Paracin in Serbia. On completion, this, it is claimed, will be the largest factory of its kind in the Balkans.

Next year the first automatic smelting furnaces will be put into operation at the new works and production greatly increased.

CHEMICAL EXPORTS FELL IN NOVEMBER

Less than the October and 1948 Totals

CHEMICAL exports from Britain in November showed a decrease in value, both when compared with October and with the corresponding month last year. November's aggregate for all chemicals was £6,593,694, against £6,961,717 in the same month of 1948 and £7,640,808 in October this year. These totals include the official groupings of chemical manufactures; drugs, medicines and preparations; dyes and dyestuffs; and paints, pigments, colours and extenders. The total figure for value of "chemical manufactures" (£3,964,734) shows a decrease of £418,443 compared with October, but a comparatively small increase (£327,280) compared with November, 1948. Practically half this last figure is accounted for by an increase of £156,302 in ammonium sulphate exports in November compared with the same month of 1948. Copper sulphate showed an increase of £40,237. There were, of course, trends in the other direction. For example, the figure for ammonium nitrate exports in November was £133,170, £102,025 less than in November, 1948.

EXPORTS

	Nov. 1949	Nov. 1948
	Cwt.	Cwt.
Formic acid	2,558	2,213
	lb.	lb.
Salicylic acid and salicylates	286,444	272,341
Value of all other sorts of acid	£103,621	£88,725
	Tons	Tons
Aluminium oxide	129	90
Sulphate of alumina	2,063	2,385
All other sorts of aluminium compounds	2,211	347
Ammonium sulphate	18,989	11,101
Ammonium nitrate	4,839	8,892
All other sorts of ammonium compounds	1,453	1,458
	Cwt.	Cwt.
Bleaching powder	11,446	52,684
All other bleaching materials	10,243	8,795
	Gal.	Gal.
Cresylic acid	310,450	187,713
Tar oil, creosote oil, anthracene oil, etc.	2,596,803	544,210
Value of all other sorts of tar oil	£64,954	£38,232
	Cwt.	Cwt.
Collodion cotton	1,588	1,988
	Tons	Tons
Copper sulphate	2,238	1,317
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	43,045	47,862
	Tons	Tons
Fertilisers	2,533	1,184
	Cwt.	Cwt.
Nickel salts	4,801	9,302
Lead acetate, litharge, red lead, etc.	5,435	10,863
	Gal.	Gal.
Tetra-ethyl lead	101,770	151,781
	Tons	Tons
Magnesium compounds	639	687
	Gal.	Gal.
Methyl alcohol	9,759	10,084
	Cwt.	Cwt.
Potassium compounds	6,799	9,236
	Tons	Tons
Salt	22,105	17,935
	Cwt.	Cwt.
Sodium carbonate	241,328	405,198
Caustic soda	219,589	153,910
Sodium silicate	17,790	21,843
Sodium sulphate	75,126	4,346
All other sodum compounds	103,611	72,767
Tin oxide	139	277
	Tons	Tons
Zinc Oxide	1,457	1,054
Total value of chemical manufactures, excluding drugs and dyestuffs	£3.904.734	£3,637,454
	Oz.	Oz.
Quinine and quinine salts	130,647	102,044
	lb.	lb.
Acetyl-salicylic acid	195,830	125,730
	100 International units	100 International units
Insulin	556,361	596,908
	Mega units	Mega units
Penicillin	591,892	526,544
Total value of drugs, medicines and preparations	£1,250,237	£1,394,818
Total value of dyes and dyestuffs	£627,778	£791,398
	Cwt.	Cwt.
Plastic materials	37,736	33,822
Value	£452,645	£414,227
	Cwt.	Cwt.
Chemical glassware	1,085	1,094
Value	£49,759	£43,186
	Cwt.	Tons
Fans	4,572	204
Value	£132,814	£136,901
	Cwt.	Tons
Furnace plant	7,019	437
Value	£75,975	£76,510
	Cwt.	Tons
Gas and chemical machinery	33,960	1,134
Value	£418,364	£272,615

IMPORTS

	Nov. 1949	Nov. 1948
	Cwt.	Cwt.
Acetic acid	—	11,528
Boric acid	4,000	—
All other sorts of acid	3,994	4,565
Borax	22,804	1,000
Calcium carbide	20	7,480
Coal tar products (excluding benzol and cresylic acid)	—	5,806
Cobalt oxides	266	818
	Tons	Tons
Arsenic	800	735
Fertilisers	1,000	8,352
	lb.	lb.
Iodine	—	132,255
	Cwt.	Cwt.
Potassium chloride	738,572	711,401
Potassium sulphate	44,500	14,040
All other potassium compounds	1,626	5,134
Sodium nitrate	120,000	59,820
All other sodium compounds	5,799	4,354
Carbon blacks (from natural gas)	72,225	86,760
Total value of chemicals, drugs, dyes and colours	£2,064,169	£2.175.455

ACCIDENTS WITH GASES AND CHEMICALS

Factory Inspector's Casebook for 1948

THE complexity of the task of reducing the annual toll of industrial accidents arising from the use of chemical materials, gases and metals is amply illustrated in the current annual report (for 1948) of the Chief Inspector of Factories.

Because of the diversity of the fields with which the chief inspector's department is concerned, no broad general causes can be indicated, although it is clear that workers' forgetfulness of the destructive possibilities of some common materials, such as oxygen and acetylene gases, acids and alkalis, leading to misuse, continued to be a fruitful source of trouble. The inability in present conditions to rebuild plants to conform with the newer precautions which have been framed in the light of long experience also discounts to some extent the good principles of which nearly all industries approve.

For the purposes of the report accidents due to hot and corrosive substances are reviewed together, and it is shown that they were collectively responsible for 8038 mishaps, of which 12 were fatal. (In 1947 there were 8353 and 12 fatalities.) Corrosive chemicals were responsible for 1843 accidents, molten metal for 1971 and hot liquids, steam and hot metal accounted for the other 4224.

It was observed that most accidents in these categories in manufacturing processes were due to splashes, and it is urged that such plant should whenever possible be totally enclosed and that one of the new and versatile recording equipments should obviate the need for inserting dipsticks, thermometers, etc. Among the principal causes of accidents in the metal industries were iron foundries, 1005; miscellaneous non-ferrous alloys, 222; molten slags, 150; and molten aluminium, 144.

Corrosive Substances

The damage caused by corrosive substances was frequently associated with transferring them from one vessel to another, and here, too, it is urged that more use should be made of modern discharging apparatus employing closed piping, suitable transport and tipping devices and closed containers.

The view is expressed that corrosive acids and caustic soda are too freely used as cleaning agents, sometimes by people unfamiliar with their destructive properties. In many industries, it is suggested one of the synthetic detergents could be used in place of caustic soda.

Fires and explosives injured 1861 persons during 1948, the great majority (1425) having been attributable to explosions, which took 55 lives—more than twice the death roll in the previous year (24). Despite the immediate increase, the figures appear to reflect a considerably increased standard of preventive measures, when one recognises (as the report does) how greatly has the use of inflammable materials increased, through the expansion of the chemical, plastics and rayon industries, and of solvents, since 1938, when 26 lives were lost.

Fire and Explosion

The most comprehensive picture of the relative dangers of fire or explosion, as reflected by experience in 1948, associated with three main sources of combustion is provided in tables relating to inflammable gases, inflammable liquids, and inflammable and explosive solids and dusts. They show, in summary, that the numbers of accidents or " dangerous occurrences " were these:—

GASES: Acetylene, 119; oxygen, 29; propane, 5; hydrogen, 10; ammonia, 4; other gases, 7; gases containing carbon monoxide, 238. (Total 412.)

LIQUIDS: Fuel and heavy oils, 98; paraffin, 46; petrol, 100; methylated spirit, 18; tar, 11; paints and varnishes, 15; miscellaneous, 140. (Nine others were individually responsible for fewer than 10 accidents. Total 478).

SOLIDS AND DUSTS: Dust explosion, 23; scheduled explosives, 27; miscellaneous, 139. (Total 484).

The continuance of a comparatively high rate of accidents associated with acetylene and, rather less frequently, with oxygen receives some comment in this report. In a review of a number of typical incidents the danger of backfires during the use of dissolved acetylene cylinders is stressed and it is suggested that effective non-return valves, possibly with flame arrestors, should be integral parts of blowpipes.

It is recognised that a very large proportion of these accidents with gases under pressure were due to operators' carelessness. Common forms of this have been the use of the wrong cylinder and failure to appreciate the great increase in combustion risks when the atmosphere is laden with added oxygen. Several incidents are cited of workers' clothing burning fiercely on coming into contact with a spark. Welding torches and cigarettes were fruitful sources of such trouble, when oxygen had been misused or permitted to escape.

The report notes that safety valves on gas equipment are not invariably vented outside the works and recommends that the precaution should be general. More than one instance is cited of accidents due to the indiscriminate release of gas through a safety valve.

Attention is drawn to some failures to recognise that ammonia gas can form with air a mixture which will explode if it is ignited Four accidents in works, connected with repairs to refrigerating equipment, are associated with ignorance of that fact.

The worst disaster with inflammable liquids—when 12 were killed and 29 injured in Hull—underlined the well recognised hazards associated with petrol and, in this report, calls forth a strong recommendation that dams to prevent the flow should be employed in any places where such inflammable liquids are capable of escaping in bulk. One of the commonest sources of trouble has been the application of heat, for repair or dismantling of vessels before completely effective steps have been taken to steam out all traces of the inflammable liquids they contained. There were 25 explosions of this kind; four people were killed and 35 injured.

A summary of causation by corrosive liquids shows that the most common individual causes of accident were caustic soda (297), sulphuric acid (139), and hydrofluoric acid (68).

The accident rate associated with inflammable liquids, the report acknowledges, would no doubt have been much higher but for the voluntary acceptance by the large users of safe codes of practice recommended by the safety organisation of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association.

Dust explosions, which continue to form the subject of detailed research by the Factory Department at Buxton, are dealt with at some length. The prime factors among preventive measures are the provision of strong enclosures to isolate the flash, with simple explosion reliefs. Their application, it is recognised, is not practicable in flimsy buildings and cannot generally be done without some constructional work.

Two-Stage Petroleum Chemicals Plan at Grangemouth

WORK on the expansion of oil refining capacity at Grangemouth and the construction of a chemicals plant, though not yet greatly advanced, is reported to be proceeding at increased speed. (THE CHEMICAL AGE, *61*, 778).

The expansion will be effected in two stages, the first of which is to be completed by the end of 1950. In stage 1 it is proposed to install a modern pipe still distillation unit, with gas stabilising equipment as well as a complete range of treating plants for refining the various fractions. The new capacity will be 1.5 million tons p.a.

Building adjacent to the refinery project is the new factory of British Petroleum Chemicals, Ltd., which will use the feed stock supplied by the refinery.

Included in stage 1 is a new steam boiler and power plant of an installed capacity of nearly 20,000 kW. This plant, together with water pumping, cooling and compressed air equipment, will be between the two new factories. The power and steam requirements of both factories will be supplied from there, when the installation is completed next year.

Stage 2, to be completed by mid-1952, will provide for the production of premium grade spirits and special products. It will include one of the most modern catalytic cracking units with a vacuum distillation unit to prepare its feed stock, and a catalytic polymerisation plant to produce a stable spirit from its exhaust gases. Treating plant will handle the products from the catalytic cracker, and there will be some distillation and treating capacity for white spirit and other special product manufacture.

Two new jetties, additional storage tanks, despatching lines and pumps, and larger road and rail car filling sheds are included in the plan to meet the increased inward and outward volume of oil traffic.

To accommodate the administrative and chemical staffs, a new office and laboratory will be erected. Provision is being made for additional housing for the increased number of employees required for the refinery and chemical factory.

FRACTIONATING COLUMN PRODUCTS

*Estimating Composition Under Various Reflux Conditions**

THE composition of the products of multicomponent fractional distillation may be specified by fixing the ratio of the two named key components. An estimate of the distribution of the other unspecified components in the product streams, though uncertain, is required as a basis for the calculation of plate-to-plate compositions.

In a graphical interpretation of the application of the Underwood method to three component systems, the invariant region and product compositions under minimum reflux ratios were examined and illustrated by diagrams.

Good separations of the key components were obtained when zero proportions of components heavier than the heavy key in the top product and lighter than the light key in the bottom product were present. Reductions of the ratios of the key components below critical values allowed the unspecified components to occur successively in the products.

Components

The distribution of a single distributed component between two key components, when the reflux ratio varied and when all the components differed only slightly in relative volatility, was given. The theoretical basis of the Jenny type of diagram, under minimum reflux conditions was presented and this diagram was used to illustrate the significance of the invariant compositions.

Under partial or total reflux conditions, all components of the feed occurred in each of the column products, although the concentration of the unspecified components might be extremely small if the ratio of the key components was high. Under total reflux conditions, the distribution of these unspecified components could be determined by successive approximations, using the Fenske-Underwood equation. A similar technique could be employed under partial reflux conditions, using the Underwood method.

To carry out this calculation, a criterion for the location of the feed was formulated. The assumption, that the optimum feed plate is that plate on which the ratio of the key components is similar to that of the feed liquid, was shown to be incorrect, but a recent empirical correlation due to Scheibel and Montrose was reasonably accurate for the system considered.

The distributions of the unspecified components between two key components in a three-component system for various reflux ratios, and for ratios of key components, were examined. The proportion of the unspecified components in the product increased to a maximum value with decreasing reflux ratio and decreased as minimum reflux was approached.

The relative variation in the proportion of the unspecified component with change in the reflux ratio was most marked in the case of sharp separations, when the absolute quantity of this component in the product was small.

The influence of errors in the preliminary estimate of product composition upon the calculated numbers of theoretical plates was considered under all reflux ratios. For practical purposes, the distribution of the unspecified components under total reflux conditions, which is readily computed, formed a suitable basis for an estimate of the distribution under partial reflux conditions. This estimate would usually incorporate a slight factor of safety in the design project, as it gives rather more theoretical plates than are required

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Chemical Processing Costs

METHODS of estimating costs of operating many types of chemical processes and plants are contained in a report just issued by the U.S. Bureau of Mines. Factors suggested for consideration include: number and type of products to be manufactured; normal operating plant and capacity and location; maintenance requirements; availability of raw materials; personnel needed; expected annual working schedule and evaluation of capital assets. A free copy of the publication, "Guide for Making Cost Estimates for Chemical-type Operations" (Report of Investigations No. 4534), may be obtained from the Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

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* "The Composition of Fractionating Column Products under Various Reflux Conditions," by J. S. Forsyth and N. L. Franklin, in a paper presented this month to the North-Western Branch of the Institution of Chemical Engineers, Manchester, of which the above is a summary.

CHEMISTS' QUALIFICATIONS

Comparative Values Discussed

IT was difficult to say what were the relative merit of the B.Sc. degree and the Associateship of the Royal Institute of Chemistry, claimed Prof. H. V. A. Briscoe, speaking at the recent general meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry.

The B.Sc. degree, he said, had, of course, a wider recognition by the public, it was given irrespective of nationality and its attainment brought the possibility of proceeding to a higher degree.

The requirements for the A.R.I.C. were more elastic, since the institute was not rigidly bound to a narrow form of regulation. From A.R.I.C. one could advance to the F.R.I.C., which connoted a higher standard of competence than did the Ph.D.

As regards comparative standards, Prof. Briscoe admitted that examination papers were not a reliable guide and, there the individual assessment was a point in favour of the institute. As an examiner for both qualifications, he thought that the standards were equivalent but not identical. The degree was more theoretical; the A.R.I.C. required practical competence. For part-time students there was a slight bias in favour of the A.R.I.C.

More Chemists and Metallurgists

A CONSIDERABLE increase in full-time work, leading to the Associateship and Fellowship of the RIC, was reported by the chemistry department of Liverpool Technical College, according to the principal, Mr. Raymond R. Butler, in a statement last week. In addition to post-advanced work in organic chemistry and chemical engineering, he said, there were special courses for local industries.

Metallurgy was being developed as an ancillary subject for mechanical engineering courses; welding activities had increased, with an expansion of the use of the cine-film to explain technique.

The college. said Mr. Butler, was acknowledged to be the Merseyside centre for advanced technological studies. There were now 6391 students compared with 3222 when he became principal in 1934. Overcrowding and small laboratories were the main problems, and obtaining highly-qualified staff under salary limitations was extremely hard.

CEMENT INDUSTRY'S CASE

Probable Effects of Nationalisation

THE case against nationalisation of the cement industry was forcibly stated by Lord Selborne, chairman of the Cement Makers' Federation, at a Press conference in Manchester last week.

Replying to the charge that the industry was a monopoly, Lord Selborne stated that the federation represented about 20 companies, nine of which are independent groups, while the rest are linked together. It was, he asserted, a contented industry employing about 16,000 people with an average wage of £9 to £10 a week, and it had never known a major strike. It had worked out its own system of profit sharing.

Under State control, cement costs would inevitably rise through inefficient management. The industry would be placed in the hands of people who were not experts.

New records for export deliveries for the first seven months of this year were announced by the chairman. The figure of 1,696,968 tons had already been exceeded by 70,768 tons, while home market deliveries, with a total of 6,755,253 tons, were only slightly below the 1948 total of 6,893,000 tons

$24,000 For Post-Graduate Work

THE award of 76 post-graduate and post-doctoral fellowships to 47 American universities for the 1950-51 academic year, involving the expenditure of $224,000, has been announced by the E. I. Du Pont de Nemours & Co., Inc. The gift perpetuates the company's plan, originated in 1918, to encourage graduate research in chemistry. It now includes physics, metallurgy, and engineering and provides support for the advanced training of students in these branches of science.

Of the 70 post-graduate fellowships, 45 are in chemistry, 15 in chemical engineering, five in mechanical engineering, three in physics, and two in metallurgy. The six fellowships are in chemistry.

First International Microchemical Congress

The Austrian Society of Microchemistry is issuing invitations to the 1st International Microchemical Congress, which will be held in Graz from July 2-6, 1950. The main purpose of this meeting is to assemble the microchemists of all countries for mutual discussions and exchange of ideas. The whole field of microchemistry will be covered.

FUSION-WELDED PRESSURE VESSELS

New Standards of Construction and Testing

THE need of chemical and other industries of a comprehensive code, of the kind employed in some other countries, relating to the construction and testing of pressure vessels has been recognised by the issue of a new standard by the British Standards Institution. This is B.S. 1500, "Fusion Welded Pressure Vessels for Use in the Chemical and Allied Industries."

Representing the first stage in a continuing programme, the code covers fusion constructed welded pressure vessels of steel and steel alloys for the chemical and allied industries. Provision has been made for the inclusion of requirements for non-ferrous vessels at a subsequent date. It is also proposed in due course to prepare similar codes to cover forged vessels and other methods of construction, such as riveting, brazing, etc.

In dealing with special activities and requirements for pressure vessels of the petroleum branch of the chemical industry, full consideration has been given not only to British practice, but also to the experience of the American petroleum industry, and acknowledgment is made to the American Petroleum Institute and American Society of Mechanical Engineers (API ASME) code.

In the British Standard code, vessels are graded according to the severity of the duty or danger, and inspection and tests of increasing stringency have been applied as the duty becomes more severe. It includes seven sections, the first of which covers the design, construction, inspection and repair of vessels in the wide field of the chemical and allied industries. Other sections deal exhaustively with such important matters as the range of materials covered and their stress values, corrosion factors, joint efficiency, tolerances, protective devices, inspection according to the duty of the vessel, testing and acceptance.

In connection with the last, the code lays it down that the manufacturer should submit for approval by the inspecting authority before commencing manufacture, a sectional drawing showing the pressure portions of the vessel and carrying the following information, in addition to the dimensions, dealing with the strength of the vessel:—Class of material; thickness of plates; method of welding; large scale dimensional sketches of the weld grooves for the longitudinal and circumferential seams and details of the joints for branch pipes, seatings, etc., and the position of these joints relative to the seams and other openings; working pressure and proposed test pressure; the extent and location of corrosion allowance.

There is an important section on suggested methods of stress relief, including heat treatment and mechanical peening. Requirements for access and inspection openings of all vessels subject to corrosion, abrasion or erosion, are given.

Copies of this standard, being distributed by the British Standards Institution, cost 25s. post paid.

American Codes for Testing Techniques

A PROPOSED testing code for sensible heat transfer in shell-and-tube equipment was among the subjects discussed at the Pittsburgh meeting of the American Institute of Chemical Engineers.

The code, which is the first in a series governing testing and equipment performance standards for chemical process equipment, is now awaiting the approval of users and manufacturers.

Reports have already been made by a number of groups, including oil companies, through the American Petroleum Institute and with the American Institute of Mechanical Engineers.

The main object of the code is to facilitate tests of heat transfer equipment for comparison with the manufacturer's predicted performance. An additional purpose is to secure reliable full-scale test data.

The code may also be applied to heaters of shell-and-tube construction where saturated steam above atmospheric pressure is the heating medium, and where the heat is absorbed as sensible heat.

The performance of absorption towers has been the subject studied by another sub-committee which is drafting a code expected to be ready in about a year.

Another sub-committee is dealing with the characteristics of dryers.

UNSOLVED PROBLEMS OF HEAT TRANSFER

U.S. Views on Direction of Future Research

THE existence of wide gaps in some of the fundamental aspects of heat transfer, calling for a variety of measurements, for some of which there are no readily applicable methods, was pointed out at a meeting this month of the American Institute of Chemical Engineers.

These points were raised at the 42nd annual meeting of the institute in Pittsburgh, by Dr. William H. McAdams, professor of chemical engineering at Massachusetts Institute of Technology. Dr. McAdams observed that the mechanism of conduction on homogeneous solids systems is well established, and a number of problems have been solved recently by analytical methods. New and better methods were required, however, to answer the problems of conduction.

Future experimental work should involve measurement of physical properties of present materials over wider ranges of conditions, and of new materials which will be developed. It would be necessary to devise methods of measuring thermal conductivities at temperatures up to 5000°F.

Combustion Effects

The transfer of heat by radiation between surfaces in transport media was now on a sound mathematical basis. In the combustion of fuels with preheated air in industrial furnaces at high temperatures, various chemical compounds of unknown radiating characteristics are formed. Because the flame temperature on which reaction rates and the nature of the products depend is controlled by heat transfer, further studies on such systems seemed imperative. Gas radiation data for steam and carbon dioxide were limited to low pressures, and the effect of high pressures should be determined. Fuels were now often burned with oxygen-enriched air, or oxygen instead of air.

With heat transfer from a solid to a fluid the situation was far more complex, both conduction and convection being involved; and heat transfer had a complicating effect on the mechanism of fluid flow which was not fully evaluated.

Various methods of attack include mathematical analogies between transport of heat and momentum, and of heat and mass. For many cases, where theory is inadequate, remarkable success has been attained in correlating data in terms of well chosen dimensionless groups of the pertinent factors, thus substantially reducing the number of variables. The greatest progress had been made in measuring and correlating local or point coefficients of heat transfer.

The field of conventional heat transfer contained a number of unsolved problems. For example, in the condensation of a vapour from a non-condensible gas, data were available only for steam and air at atmospheric pressure; there were no data for dehumidifying a mixture of various vapours and non-condensible gases. Promoters have been found to render certain metals non-wettable towards condensed steam; they permitted dropwise condensation which gives much higher coefficients of heat transfer than does film-type condensation.

Unconventional Media

Novel applications of heat transfer between surfaces and fluids involved both conventional and unconventional heat transfer fluids, frequently with unusually high density of heat flux and high temperature level. Such conditions were beyond the range of existing empirical equations, and lack of fundamental data on velocity and temperature fields caused a good deal of uncertainty as to the reliability of theoretical relations.

Much remained to be done to collect data for the new conditions, including physical properties of many heat transfer media. Further work is required on forced convection at very high gas velocities.

Beet Sugar Waste Disposal

AN alternative method of treating the wastes from beet sugar refining was outlined by Dr. Clair N. Sawyer (Massachusetts Institute of Technology) at the recent 42nd annual meeting in Pittsburgh, Pa., of the American Institute of Chemical Engineers.

Chlorine is added to destroy the bacteria and simultaneously precipitate the undesirable organic compounds. Lime is then added to counteract the acidity of the chlorine treated water, so that the liquid is relatively harmless and may be emptied into any freshwater stream.

Disposal of wastes from petroleum refineries, coke plants, tanneries and breweries were among the wide variety of subjects covered.

HIGH VALENCY COBALT

Preliminary Results of Research at Padua

PRESENT knowledge on the oxides of chemical elements clearly shows that in many cases, as for instance iron, cobalt, nickel, copper, and bromine, the highest valency is still ill-defined or unknown. Some researches have lately been carried out by Prof. Ugo Croatto, of the University of Padua, to ascertain the highest valency obtainable with cobalt by oxidation with oxygen in the presence of oxide and peroxide of sodium. The substances employed were: CO_3O_4, Na_2O, Na_2O_2, O_2.

The researches were concerned with mixtures of oxide and peroxide of cobalt in the compounds Na/CO = 2, 3, 4, 5, 6. Heating temperature: 300-500°C. and pressure of oxygen 1 atmosphere. The reaction products were coloured an intense blue.

Tetravalent Cobalt

The conclusion reached by Prof. Croatto, is that by oxidation at various temperatures, with oxygen and oxide or peroxide of sodium, cobalt assumes a positive tetravalency. The anhydritic character of CO^{4+} is revealed in the formation of the *o*-oxycobaltate of sodium, Na_4CoO_4, unknown till now. It is a blue-coloured compound, alterable under the action of carbon dioxide and of water, without disengaging oxygen. With the acids on the contrary it disengages oxygen, producing salts of Co^{2+}.

This valency has been already pointed out on other cobalt compounds, but they were not always well defined or surely ascertained. Among them is observed the cobalt dioxidehydrate $CoO_2.H_2O$ and the cobalt compounds $MgO.CoO_2$, $BaO.CoO_2$, $BaO.2CoO_2$ and $K_2O.CoO.3CoO_2$. These salt compounds may be described as cobaltates, representing the highest form of oxidation attained.

Of the oxide Co_3O_4 there is a well-founded hypothesis that it is a salt oxide, pertaining to the oxides of the bi- and tetravalent cobalt, rather than to the bi- and trivalent cobalt. Perhaps even Co_2O_3 might be considered as a salt oxide between bi- and trivalent cobalt.

The co-ordination 4 in the *o*-cobaltate of sodium perfectly agrees with the dynamic considerations relating to the electrostatic attraction-repulsive influences among the various ions composing the complex anion $[CoO_4]^4$.

Calculation of the electrostatic factors in the building of a complex, contacting with a co-ordinating tetravalent ion a number *n* of ions O^{2-} that initially were infinitely distant, serves to reveal the highest development of energy—conditions of stability—when *n* = 4 with a tretrahedric arrangement, or when *n* = 3 with plane triangular arrangement, according as the radius of the co-ordinating ion is greater or smaller than 3.15Å. Because the ionic radius of Co^{4+} is doubtless greater than 3.15A, Prof. Croatto concludes in favour of the co-ordinate 4 in the "*o*-oxy-cobaltates."

This co-ordinate had never yet been attained in the known compounds, with the exception of the salt oxide Co_3O_4.

Prof. Croatto has made a similar investigation in respect of iron. The substances employed were the same as those employed with cobalt, but the oxide and peroxide of cobalt were replaced with sesquioxide of iron. The researches were made with mixtures having the composition Na/Fe = 2, 3, 4, 5, 6, 7, heated to 300-450°C. in a medium of oxygen, at atmospheric pressure. The quantity of oxygen discharged under the action of water and sulphuric acid was measured; in the residuary solution the iron was reduced to bivalency and titrated by means of permanganate.

Positive Hexavalency

The conclusion reached by Prof. Croatto is that by oxidation at various temperatures with oxygen and oxide or peroxide of sodium, iron assumes positive hexavalency. The anhydritic character of Fe^{6+} is revealed in the formation of the *o*-oxyferrate of sodium (Na_6FeO_6).

This valency is already known for other alkaline or alkaline-earth ferrates, but in the "meta" form. Among them one of the most stable is K_2FeO_4. The co-ordination 6 in this form is remarkable, as it does not agree with the conventional view according to the calculation of the electrostatic work in the building of complexes.

Cellulose Plant for Morocco

A project for the construction of a cellulose factory is now taking shape in Morocco. Treatment capacity would be 30,000 tons a year, increasing to 100,000 tons. Output would necessarily depend upon wood production which is expected to reach 70,000 tons in 1960.

THE WIDENING FIELD OF TALL OIL

Many New Uses Foreshadowed in Patent Literature

From A SPECIAL CORRESPONDENT

PRIOR to 1939, tall oil, the brown oily resinous liquid, obtained as a by-product of the sulphite-paper process, was regarded merely as a cheap substitute for natural oils and fats. Research carried out during the last 10 years has not only made possible great improvements in the quality of the oil, but opened up uses for it in some 42 distinct industries.

Apart from the normal high grade crude tall oils produced by blending soap skimmings from various kraft paper mills, it is possible by solvent refining processes to manufacture a range of non-crystallising oils, many of them free from objectionable smelling mercaptans and possessing a very light or pale colour. As the colour stability at average temperature is of a high order, light coloured solvent refined tall oils can be used for the manufacture of detergents, glyceryl phthalate alkyds, soaps and similar products. Polymerised tall oils are now being manufactured for special purposes. These have a good odour but are dark in colour.

Vehicles and Emulsions

The resin acids are stabilised and non-crystallising and their sodium salts have excellent carrying powers for mineral oils. Products of this kind are used in wood oils, cutting oils, disinfectant sprays, weed killing preparations, etc.

Stable or semi-stable emulsions can be made from polymerised tall oils for use as flotation agents in mining industry. Partially hydrogenated tall oil with a titre of 52.8°C. is being used for the preparation of polishing compounds and for dressing and impregnating textile materials.

Tall oil was widely employed during the war as a substitute for resin and linseed oil in linoleum and surface coating compounds. A review of the uses found for tall oil in Germany was given in a FIAT final report (No. 1144, June 5, 1947). This deals mainly with the products made by Spangenberg Werke Hamburg-Eidelstandt, Germany. Methods are given for preparing a substitute for linseed oil, stand oil to be used in the paint industry; tall oil Beckosol, a cheap resin used for wire coating and for petrol tanks; and lumitol, to be used as a linseed oil substitute in enamels and varnishes.

Tall oil has indeed hundreds of uses in addition to those it serves in the coating industries. A Norwegian patent, 65,350, taken out in 1940, discloses a method of converting tall oil into an adhesive and impregnating agent for paper and bond. The acids in the oil are neutralised by heating it with a suspension of lime in water; the excess calcium hydroxide acting as a filler. Most of the water is then evaporated and the resulting product is heated for 15 minutes at a temperature of 130-140°C.

An American patent, 2,424,047 (1947), gives details of the manufacture of an adhesive compound made by esterification of tall oil with polyhydric alcohols. Direct esterification of the alcohol with the acid, with or without solvent, is one method of producing this kind of compound; the acid exchange between tall oil and a polymer of an allyl-type ester is another. The tall oil ester resins made in this way are claimed to be of interest as general adhesives and interlayers for laminated articles; as self-sustaining films, and for sizing and impregnating cloth, felt or paper.

A Swedish patent, taken out over 20 year ago (53,028, May 1919), gives a method of making a tall oil adhesive by mixing 92 parts of asphalt, 5 parts of tall oil and 3 parts of a siccative.

Flotation Agents

Ammonium tall oil soaps are of interest as flotation agents. These, according to U.S. patent 2,238,021, can be made by dissolving the oil in alcohol (methyl, isopropyl, secondary and tertiary butyl and amyl tertiary alcohol) and passing into the solution anhydrous ammonia, to yield an alcoholic solution of anhydrous completely saponified ammonium tall oil soap. Another U.S. patent, No. 2,373,305 (1945), mentions the use of tall oil for the flotation of tungsten ore.

It is claimed by the patentees that an improvement in the concentration of carbonate-containing tungstate minerals and silicon bearing gangue during the flotation step is conferred by the presence of a reagent combination of an ionic promotor from the group consisting of the higher aliphatic fatty acids, tall oil, and the ammonium, potassium, or sodium salts of fatty acids and tall oil; an alkali salt of a dialkyl sulphosuccinate; and a gangue depressant. Promoters for acid minerals in froth flotation, agglomeration, tabling and stratification may be produced by the reaction of polyalkylene polyamines with tall oil at 230-240°C. This is covered by U.S. patent 2,312,387 (1943).

An interesting use for sulphonated tall oil is suggested by U.S. patent 2,423,314 (1947) in the concentration of oxidised iron ores from mixtures which contain acidic gangue and both magnetic and non-magnetic iron oxides. A reagent made up of 75 per cent tall oil, 20 per cent ammonium sulphate derivative of diethylene glycol laurate and 5 per cent octyl alcohol is recommended for use as a stable flotation agent, possessing strong collecting properties for baryta ores and depressing properties for siliceous materials, limestones, oxides of aluminium, iron, manganese and titanium. This flotation compound is described in U.S. patent 2,378,552 (1945).

In the manufacture of fibre bonds and the impregnation of paper, increasing use is being made of tall oil. A Swedish patent No. 109,319 (1943) covers the employment of calcium salts of tall oil acids, which have been purified by an oxidation process or treated with sulphur chlorides, for the impregnation of paper or bond.

A Canadian patent, 434,183 (1946), describes the production of a pressed fibrous product made with the aid of tall oil. An emulsion of the oil made by heating it with water at 140°F. is added to the fibrous material. The oil is then precipitated into the fibres by an acid-reacting metallic salt, the suspension formed into a coherent mass, dried and consolidated at a temperature between 350 and 500°F. under a pressure of 500 to 1500 p.s.i. The hard bond produced in this way contains 2-10 per cent tall oil, has a density of 50-72 lb. per cu. ft., and varies in thickness from 0.1 to 0.25 in.

Replacing Sulphonated Castor Oil

In the manufacture of coated paper, tall oil is assuming some importance as a replacement for sulphonated castor oil; according to some authorities it increases the folding endurance and bursting strength. High tear resistance is imparted to test sheets with clay casein coatings containing sulphonated tall oil. Compositions made up of 2-8 parts sulphonated tall oil, 6-16 parts zein, 0.3-0.5 parts caustic soda, 60-200 parts water and 100 parts china clay are claimed to have advantages over standard coatings because of their lighter colour, elimination of frothing difficulties, improved printing characteristics and ease of use in connection with a roll-coating machine.

American patent 2,370,268 describes methods of using tall oil in such compositions.

The use of tall oil in the manufacture of synthetic or soapless detergents is of topical interest and has produced a number of patents. A British patent, 491.960 (1938) was filed describing one such detergent made by saponifying the oil with an excess of an alkaline solution, adding a grease solvent and sufficient phenol to neutralise the excess of alkali. The U.S. patent 2,290,583 (1942) discloses a method of producing tall oil detergents by chlorinating the fatty acids of tall oil and reacting with a glycerine-oleum mixture and finally neutralising. The finished product is said to be useful as a dispersing, emulsifying, penetrating, solubilising, washing and wetting agent.

Separating the Fatty Acids

Tall oil consists of a complex mixture of fatty acids in the forms of oleic and linolenic acids, with small amounts of palmitic and isolinolenic acids and resin acids such as oxyresinic and abetinic acids. Various processes have been suggested for separating the valuable fatty acids from the resin acids. Hydrogenation followed by selective absorption is one of the best methods and offers important advantages over the more conventional fractional distillation. It is less expensive and gives greater yields.

If tall oil is hydrogenated to reduce the component acids to two, these can be isolated by passing a solution of the mixture through a column containing activated carbon. In this way stearic acid can be isolated from abietic acid. Fractional crystallisation is sometimes used for isolating hard fatty acids and abietic acids from hydrogenated tall oil. U.S. patent 2,280,842 (1942) offers a method of isolating fatty acids from tall oil on these lines.

Metallic salts or soaps can be prepared from tall oil, for use in the mildew proofing and waterproofing of textile fabrics. For the saponification, metallic salts, such as carbonates, chlorides, hydroxides, or oxides of metals, are used. To ensure that no soluble alkali soaps are formed alkali impurities have to be rigidly excluded.

Satisfactory vehicles for inks can be made by reacting tall oil with lime and then mixing with a small percentage of linseed or other drying oil. The oil is heated to 180-200°C. with 5 per cent

(continued at foot of next page)

Alcohol from Cassava

U.S. Develops a Cheaper Extraction Method

A NEW and cheaper U.S. method of extracting alcohol from the South American cassava plant, which is said to open the way to far wider use of this source of high-quality alcohol, was reported to the American Chemical Society recently in a paper by three chemists of Joseph E. Seagram & Sons, Louisville, Kentucky.

The cassava, source of the starch used in making tapioca, sprouts from 3 to 9 ft., and is supported by a cluster of tapering cylindrical roots 3 ft. long and 6 to 9 in. in diameter. Starch accumulated in the roots can be converted to fermentable sugars by submerged culture fungal enzymes in the new process, which is "considerably less costly" than the barley malt process used in the U.S.A., the paper said. It also anticipated that the manufacture of fungal enzymes would be feasible in other countries and that cassava could be further exploited for the production of alcohol.

The paper, by C. Teixeira, A. A. Andreasen, and Paul Kolachov, noted that tapioca is a principal export of Brazil and other South American countries, and that Brazilian industry relies on the cassava roots, which contain 25 to 30 per cent starch, for the production of alcohol and the manufacture of glue and textiles. The starch is also added to wheat flour to reduce the amount of wheat that must be imported.

Cassava alcohol is described as a high-grade product used in the finest beverages and perfumes. The alcohol is now exported principally to Switzerland, where it is in great demand, stated the paper.

Brazil's cassava output has increased considerably in recent years, reaching 9 million tons, with an estimated value of $115 million in 1946. The herbaceous shrub is also cultivated extensively in tropical West Africa and the Malay archipelago, as well as in other South American countries. Yet, in spite of great possibilities offered by the cassava plant and its early discovery during the colonisation of Brazil, its use is still not extensive, the chemists said.

Listing the methods used in the past to extract cassava alcohol, the paper declared that microbial enzyme preparations offer the most inexpensive, efficient, and successful conversion agents. Extensive research in the production of mould bran and liquid fungal submerged culture preparations had resulted in the possibility of further exploitation of starchy raw materials for the production of alcohol. The use of submerged culture fungal enzymes for conversion resulted in higher yields of alcohol than could be obtained by either barley or corn malt.

THE WIDENING FIELD OF TALL OIL

(*continued from previous page*)

hydrated lime. The temperature is then raised to 220°C. and held for 5-6 hours. This is the subject of U.S. patent 2,416,676.

Some lubricants have been based on tall oil and one of the most interesting processes is outlined in U.S. patent 2,385,912 (1945). This entails esterifying tall oil with glycerol and sulphurising the esters with sulphuryl halides or oxyhalides, active or elemental sulphur. The resultant product is blown with air to remove all disagreeable smelling volatile products. It is claimed that the esters made in this way have the desirable lubricating properties—oiliness, tenacity, wetting power, compressibility and anti-corrosive properties.

Some interesting developments can be anticipated with some confidence by the plastics industry, judging by the large number of patents covering processes of making resinous compositions. One such patent discloses a method of esterifying polymerised tall oil with saturated alcohols in a mixture of vinyl ethers, which have a plurality of vinyl groups in the molecule, to obtain interpolymerisation products capable of wide use.

There is no doubt that tall oil is assuming importance as an industrial raw material, or that it merits the consideration of chemists in industries producing adhesives, binders, cleaners, cutting oils, disinfectants, drawing oils, dust palatives, flotation agents, weed-killers, lubricants, paints, plasticisers, polishes, waxes, rust inhibitors, soaps, wetting agents, etc. Although the composition and quality of tall oils vary considerably with climatic conditions and the geographic location of the pulpwood, it is possible by clever blending and rigid laboratory control to procure oils having the highest degree of uniformity.

THE CHEMISTRY OF FUR DYEING

Use of Wide Range of Coal Tar Intermediates

SOME millions of fur skins are handled in this country every year, and all require to be dressed and 75 per cent require to be dyed. The aim of the fur dyer is to imitate the colours of the natural furs at their best and also to produce other colours and effects as required by fashion, the most popular hues being greys and browns.

There is a very wide variation in the nature and behaviour of the constituent fibres of furs. While the softer under fur resembles wool and can be dyed with comparative ease, the long and resistant guard hairs vary from species to species treatment before dyeing.

The distribution and texture of these guard hairs varies from species to species and even from skin to skin, while a considerable variation in colour may also be encountered in the same skin. A further problem is presented by the leather, which on exposure to temperature much above blood heat would shrink and become partly gelatinised and on drying would be hard and brittle. Consequently, the dyer is restricted to materials which can be used in the cold, and this precludes the usual textile dyes such as are employed for wool or silk.

Another difficulty is that the materials used in dyeing may remove some of the leather-forming ingredients used in dressing, so that it is often necessary to redress skins after dyeing. Thus fur dyeing is one of the most difficult and at the same time one of the most fascinating branches of dyeing. Some of its problems and processes are unique.

Vegetable and Aniline Dyes

Up to 50 years ago, fur dyeing was carried out on a relatively small scale with vegetable dyes such as were used in the textile and leather trades, but with the addition of alkaline treatments known as " killings " to increase the affinity of the fibres for the dye. The aniline dyes discovered in 1856 have not been extensively used for fur dyeing, partly because of the unsuitability of the bright colours for furs and partly because of their poor affinity at low temperatures. To a limited extent, however, they are used in the production of fancy colours on white furskins for special purposes, the leather being treated to withstand a higher temperature.

Modern methods of fur dyeing may be said to have originated from discoveries patented 60 years ago by a German chemist, H. Erdmann, who found that certain diamino and amino-oxy derivatives of benzene, on treatment with oxidising agents such as hydrogen peroxide, produced colouring materials having a great affinity for fur and other animal fibres, which previously could be dyed only after long and drastic treatments. A further advantage of the modern methods is the wide range of shades produced by mixing, the range being so comprehensive that nowadays furs can be dyed in almost any colour and shade.

Modern Methods

The most important member of the group of dyes originates from the *p*-phenylene diamine, which in a chemically pure state is colourless. The dyestuff itself evolves only during the dyeing process through oxidation. Hydrogen peroxide serves as the oxidising medium and its effect is furthered by the mordants still remaining in the hair. An essential point is that the dye develops sufficiently at a normal temperature (30° C.), so that the leather is unharmed.

Among the most commonly used of these coal-tar intermediate products are *p*-phenylene diamine, which gives dull purple; chlorparaphenylene diamine (reddish brown); *p*-aminophenol (pinky brown), *o*-aminophenol (yellow), *p*-amino-dimethylaniline (grey), *p*-amino-diphenylamine (greenish-grey), and *m*-diamino-phenetole (brownish-grey). A wider range of shades can be obtained by the use of pyrogallic acid, resorcin, pyrocatechin and other phenolic substances in conjunction with the amines and aminophenols.

As a rule, two or more of these fur bases have to be mixed to give the desired result, so that the individual components can react with one another during the development of the dye. Different mordants used for the pre-treating in dyeing cause further complication in the structure of the colours produced, the results being occasionally disconcertingly unexpected.

The first stage in the oxidation of *p*-phenylene diamine is the formation of di-imine, $NH : C_6H_4 : NH$. This compound is very unstable and three molecules of it condense to form tetramino-diphenyl-para-azo-phenylene, an insoluble brown-black substance known as Bandrowski's base. By intermolecular rearrangement this is capable of forming an azine claimed to be the leuco-compound of the trimolecular *p*-amino-diphenylamine.

The products of further oxidation are influenced by the *p*H value. On the acid side up to *p*H 7 the resultant dyeings are from the lightest straw colour to the deepest blue. On the alkaline side the dry process leads to a plain azine.

If *p*-diamine and *m*-diamine are combined, as is often the case in black dyeing, an indamine is formed as an intermediate phase and an unstable toluylene blue is obtained. On further oxidation this substance changes into a leuco-azine, which is a stable toluylene red.

Oxidation Colouring

The actual process of dyeing consists of dissolving the appropriate fur base or mixture of bases in water and adding sufficient hydrogen peroxide. The skins are then immersed in the dye bath and stirred at regular intervals to ensure even dyeing. The development of the oxidation colour may require as long as 12 hrs. to complete. The molecules of the fur bases penetrate into the fibres and are partly oxidised inside them, while a certain amount of oxidation product is also deposited in the dye bath and on the surface of the fibres.

Until 1914 practically all dyes of this type, including all the special dyes used in the fur industry, had to be imported from Germany. During the first world war, the manufacture of fur dyes was developed in Britain by the British Dyestuffs Corporation, one of the four main concerns which, by the merger in 1926, became Imperial Chemical Industries, Ltd., with the result that the British fur processing trade is now entirely independent of imported supplies and can obtain its full range of requirements from local sources.

Besides oxidation dyes the fur trade also uses mordants, as in the textile trade, those most widely employed being copper, iron and chrome. On a mordanted fur the colours produced are generally darker and faster, while the tone is altered according to the type of mordant used.

Since most fur skins which are plentiful are also coloured, the natural colour has frequently to be removed in order that the furs may subsequently be dyed to the pale and medium shades which are in demand. Nowadays about 25 per cent of all furs are bleached, the most satisfactory results being given by the use of hydrogen peroxide in an alkaline solution. The bleaching action on the pigmented part of the skin may be activated by the use of mordants, but careful control is necessary in order to avoid damage to the fibre structure.

Even skins of the same type are liable to behave differently in the dyeing process, so that individual sorting and evening-up in colour is often necessary. Great care has also to be taken in the selection of skins before dyeing and the rejection of those that are unsuitable. On the other hand the skilful combination of treatments and blending of materials can produce a very wide range of shades and effects.

Though many of the basic principles underlying the dressing, mordanting, bleaching and dyeing of furs have been established, there is still very much to be learned. Much work has been done by the Leeds school on the nature, physical and mechanical properties of animal fibres, while the fur dyeing industry is devoting considerable attention to the more technical aspects of processing and production.

This article is based on information supplied by C. W. Martin & Sons, Ltd., a leader in the fur dressing and dyeing trade, having a research department which is constantly carrying out investigations into the fundamental aspects of fibre processing. These findings are applied by the development department, which has for several years been devoting particular attention to improved methods of processing and to fastness of colours.

New Aluminium Powder

"SAP" (Sinter Aluminium Pulver) is the name of a new aluminium product, developed by the Swiss aluminium concern, Aluminium-Industrie A.G., Chippis. This powder—either pure aluminium or alloy powder—is stated to produce shapes or pressed profiles possessing all the mechanical characteristics of tempered aluminium alloys. Products made from SAP do not lose stability when heated for a prolonged period at high temperatures. Its expansion rate is claimed to be much lower than that of normal aluminium alloys.

SAP made from pure aluminium, without alloying substances, is said to have an electric and heat conductivity of 80 per cent of that of pure aluminium. It is believed that it may have uses where aluminium has been ruled out hitherto because of its relatively low heat resistance. Its physical characteristics—high conductivity, low expansion co-efficient and the absence of permanent change in length—would recommend it in particular for use in pistons. SAP is not yet being made on a commercial scale, but small samples, in the form of pressed bars, are being exported. Its price is reported to be substantially higher than aluminium equivalents.

HOME

Changed Telephone Number

The telephone number of the British Aluminium Co., Ltd., at Salisbury House, London, E.C.2 changes tomorrow to Monarch 4422.

Trophy for Australian Workers

Employees in the Explosives Division of I.C.I., Ltd., at Ardeer, have sent a silver punch bowl to their colleagues in the Deerpark factory in Australia for competition in the annual sports meeting there.

Best Week's Coal Output

Lord Hyndley last week congratulated British coal miners, expressing the National Coal Board's appreciation of the efforts of miners and managements which, last week, produced no less than 4,566,000 tons of deep-mined coal. This, he said, was a big achievement and the best output from the pits since the weeks of Dunkirk.

Neglected Peat Resources

The failure of Britain to develop her rich peat resources was stressed by Mr. David Murray at a meeting, recently, of the Royal Scottish Geographical Society. Although peat was an important source of chemicals, Mr. Murray urged that its obvious use—as a fuel—should be given priority. He cited the German and Russian uses of peat as a source of power, for electricity and transport.

"Giant Miner" Demonstrated

The 15-ton "mechanical miner," developed in the U.S.A. by the Joy Manufacturing Company (The Chemical Age, *60*, 98), had its first trial in a British mine at Donisthorpe Colliery last week. The machine, which has seven electric motors giving 162 h.p., was demonstrated in operation by an American mining technician. It is to be used for experimental purposes at Donisthorpe Colliery.

Chemical Workers' Savings

Figures issued by the National Savings Committee, for concerns employing over 500 people in the chemical industry, show that during the quarter ended September last the average invested per savings group member was £4 18s. 7d. against £3 19s. 5d. the previous quarter. The national average for all industries is £4 5s. The total savings in the chemical industry was £241,389, over 25 per cent of employees saving through 94 National Savings Groups.

Textile Conference

Cheltenham will be the venue for the Textile Institute's 1950 conference, from June 6 to June 9 inclusive. An exhibition of instruments for the measurement of yarn irregularities is to be held.

Christmas Gifts

The Matron of the Olive Mount Children's Hospital, Liverpool, was presented, on December 21, with a large collection of toys by the employees of Evans Medical Supplies, Ltd.

Science Masters' Conference

The annual conference of the Science Masters' Association will be held at the University of Edinburgh from January 3-6, 1950. This is the first occasion in the 49 years of its history that the association has met in Scotland. The presidential address will be given by Sir Edward Appleton. Laboratory space has been set aside for demonstrations.

Scientific Films Census

A survey is being made by the Scientific Film Association of makers, owners and users of scientific films. It is intended to compile a reference catalogue of this information, giving the maker's name and address, the title of the film, its gauge and length of running time, and a brief synopsis. Such details are sought by the association at 4 Great Russell Street, W.C.1.

Machinery Imports

Following the removal on September 29 of import licensing restrictions on imports into the U.K. of machinery and plant from OEEC and other soft-currency countries, the Board of Trade points out that it is still necessary to apply for a "duty-free" licence. The dispensation in respect to import licences relates only to imports of machinery which cannot, at present, be procured within the United Kingdom

Soap Economy Tablets

A new soap product recently launched by A. Campbell and Co. (Kwik-Wash), Ltd., Hillington, Glasgow, is finding a demand from institutional buyers. Designed to save washing powder, soap, or other cleaning materials, the new product is a tablet of soluble detergent measuring roughly 1½ in. by 2 in. by 1½ in. It has been formulated to be used in the proportion of one tablet per pail of hot water, thus permitting a standard issue for cleaners' operations.

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Next Week's Events

MONDAY, JANUARY 2

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. Dr. H. A. Thomas: "Electronic Techniques in Scientific Research."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 6.30 p.m. Joint meeting with the Hull branch of the National Federation of Master Painters and Decorators.

TUESDAY, JANUARY 3

Society of Public Analysts and other Analytical Chemists

London: Imperial College of Science and Technology, South Kensington, S.W.7, 6 p.m. (Physical Methods group.) "Spectroscopy"; papers by A. A. Smales, R. A. C. Isbell and D. C. M. Adamson, followed by discussion.

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Discussion: "Practical Plating Problems"; opened by C. Wharrad (past chairman, Midlands Centre committee).

Incorporated Plant Engineers

Cardiff: Grand Hotel, 7.30 p.m. (South Wales branch.) "Arc Welding."

WEDNESDAY, JANUARY 4

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. J. D. Bolckow: "The Lay-out and Equipment of a Modern Welding Shop."

Institution of Works Managers

Wimbledon: Town Hall,. 6.45 p.m. (S.W. London sub-branch.) R. Pugh: "The Value of Publicity in the Works."

THURSDAY, JANUARY 5

Institute of Packaging

London: Waldorf Hotel, Aldwych, W.C.2, 6 p.m. A. S. Wharton (Phillips Electrical Industries, Ltd.): "Packaging Inspection."

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. T. P. Hoar: "Corrosion Testing."

London: 4 Grosvenor Gardens, S.W.1, 7 p.m. L. A. J. Lodder: "Zinc Casting Alloys: Their Development and Use."

Leeds Metallurgical Society

Leeds: University, 7 p.m. Film: "The Bragg Soap Bubble."

Oil and Colour Chemists' Association

Newcastle: Royal Station Hotel, 6.30 p.m. W. Hancock: "Some Considerations of the Mechanics of Paint Milling."

Incorporated Plant Engineers

Peterborough: Eastern Gas Board, Church Street, 7.30 p.m. G. W. S. Burdett: "Machine Tool Development."

FRIDAY, JANUARY 6

The Paper Makers' Association

Manchester: (Technical section, northern division.) F. A. Craig: "Dyestuffs and their Application to Paper."

SATURDAY, JANUARY 7

British Interplanetary Society

London: Tudor Room, Caxton Hall, 6 p.m. K. W. Gatland and A. E. Dixon: "The Circum-lunar Rocket."

PERSONAL

COLONEL H. C. SMITH, deputy chairman of the Gas Council, has been re-elected president of the British Road Tar Association for the third successive year. Other officers appointed for the 1949/50 session were: MR. G. A. HEBDEN, director and general manager of the South Yorkshire Chemical Works, Ltd., who represents the coke oven interests, and MR. STANLEY ROBINSON, managing director of the Midland Tar Distillers, Ltd., re-elected vice-presidents; and W. K. HUTCHISON re-elected honorary treasurer. MR. J. DAVIDSON PRATT, director and secretary of the ABCM, is chairman of the managing council.

The honorary degree of Doctor of Science is to be conferred by Leeds University on May 10, 1950, on EMERITUS PROFESSOR ROBERT W. WHYTLAW-GRAY, who was professor of chemistry at Leeds from 1923 until 1945. He was also chemical adviser to the Chemical Warfare Committee during the 1914-18 war and was the British representative in 1940 on the Committee on Atomic Weights of the International Union of Chemistry.

DR. GEORGE GRANGER BROWN, of the University of Michigan, has been appointed director of engineering for the U.S. Atomic Energy Commission. He is particularly well known for his work in the field of distillation, has been on the chemical engineering staff at the university for 25 years and has been head of the department since 1942.

◆ OVERSEAS ◆

Metals Decontrolled in Sweden

After nearly 10 years, Government requisitioning of tin, lead, and metal alloys finished in Sweden on December 10. Import licences are still required when purchasing these metals abroad.

Aluminium Houses for Pakistan

An aluminium house under construction in Karachi, the first of its kind in Pakistan, by a London aluminium engineering company, has been inspected by Mr. C. N. Ahmed, Pakistan's Minister of Industries, who expressed confidence that the method would be widely adopted in Pakistan.

Largest British Petroleum Source

Canada's petroleum production in the Province of Alberta for the first eight months of this year, of 12,730,000 barrels was 93 per cent higher than in the corresponding period in 1948. Canada now ranks as the largest British oil producing country. Large scale refining developments are taking place in Western Canada.

Nitrogen Production in Norway

The new Norwegian nitrogen plant at Glomfjord, north of the Arctic Circle, is reported now to be in operation with a capacity of 150 tons daily. Production will be sent by boat to Eidanger to produce 250,000 tons of nitrogen fertiliser annually. Glomfjord has an electrical convertor of 72,000 kW, one of the largest in Europe.

Tunisian Oil Concessions

The *Official Gazette* of Tunisia contains the registration of two companies formed to exploit the oil wealth of Tunisia. The first, the Société Nord-Africaine des Pétroles, formed with an initial share capital of Fr. 1500 million, of which 65 per cent is held by the Gulf Oil Corporation and the remainder by the Société d'Etudes de Recherches et l'Expoitation des Pétroles de Tunisia, has obtained a concession in the region of Sfax, covering nearly 5 million acres. The second, the Compagnie des Pétroles de Tunisie, is a joint organisation of the Shell group, which holds 65 per cent of the initial share capital of Fr. 300 million, and of the Sociéte Nord-Africaine. It will exploit a concession in the Sousse region, extending over some 2.5 million acres. Should oil be discovered, preference is to be given in supplying the needs of Metropolitan France and local requirements.

Hamburg Refinery Re-opened

The Shell Group's oil refinery at Hamburg, which was greatly damaged during the war, was re-opened last month. Crude throughput will be about 440,000 tons annually.

Dismantling Bavarian Aluminium Works

U.S. authorities in Bavaria have requested the Bavarian Government to begin the partial dismantling of the Töging plant of the Associated Aluminium Works, Ltd. Capacity of the plant will be reduced by about 35 per cent.

New Swedish Coke Works

Permission from the building control authorities to construct a new coke works costing between nine and 10 million kronor, has been received by the Oxelösund Iron Works, A.B. The new works is expected to have a daily capacity of 420 tons compared with the present output of 310 tons daily.

Improved U.S. Moulding Compounds

Three new Hycar-phenolic moulding compounds have been developed by the U.S. General Electric Company's chemical department. The products are an asbestos-filled, a cotton flock-filled, and a fabric-filled compound. They are claimed to have unusual shock, vibration, and fatigue resistance.

Soviet Atomic Research Boast

A new device in nuclear research, claimed to combine the advantages of the American cyclotron and betatron, has been developed in Russia, according to the Soviet News Bureau in Berlin. The machine, designed by Professor W. L. Weksler, is said to impart much greater energy to electrons than does the betatron. "Any desired change in the nuclei can be carried out with this machine," the report said.

Electronic Heating for Welding

Electronic heating used in conjunction with welding work was found to be a valuable time-saver recently when it was used in the repair of a fractured shaft of a 25-megawatt steam turbine at the Bunnerong Power House at Botany, New South Wales. The ability of the equipment to create localised heat of controlled intensity was found of great value for preheating, for normalising the turbine shaft during welding sequences, and for removing and refitting large sealing sleeves.

INDIA'S CHEMICALS AND FERTILISERS

Important Raw Materials Lost to Pakistan

INDIA, before the war, lacked a well developed chemical industry, but considerable impetus was given during the war to the development there of acetic acid, lead acetate, sodium and potassium bichromates and caustic alkalis. At the time of partition, her chemical industry may be said to have been a growing one, but it received a damaging setback as the separation left some of its important raw materials in Pakistan. Particularly, India was then deprived of the sulphur resources of Baluchistan and the salt and gypsum of the Punjab.

Sulphuric Acid Needs

The estimated annual requirements of sulphuric acid of undivided India (for users almost entirely in the Indian Union) amounted to 80,000 tons, according to a survey, by Mr. Rowland Owen, senior U.K. trade commissioner in India, of that country's economic and commercial conditions (HMSO, 4s.), from which the following particulars of her chemical economy are taken. Production is widely dispersed, West Bengal and Bombay having six major sulphuric acid plants each and Bihar four. The total rated capacity of these units together is about 100,000 tons per annum; but peak production in 1945 amounted to only 62,500 tons Production during 1948 amounted to about 80,000 tons, a quantity which appears to be in excess of the capacity of local consumers to absorb.

Supplies of sulphur in the immediate pre-partition period were furnished mainly by U.S.A. (over 100,000 tons in 1946-47), and since partition by the same source (over 300,000 tons in six months ending September, 1948).

The estimated annual caustic soda requirements of the Indian Union amount to about 70,000 tons, divided as follows according to official estimates:—

	Tons
Soap	24,000
Cotton textiles	16,000
Paper	9,000
Chemical industry	2,100
Vegetable ghee and oil refining industries ...	1,500
Other miscellaneous requirements	17.000

For the bulk of its caustic soda requirements the country is dependent upon imports. Annual production is, about 3000 tons a year but capital equipment is arriving which should result in an increase. Supplies have been received since partition mainly from the U.S.A. and the U.K. (467,000 and 247,000 tons respectively in six months ending September, 1948).

The claims of the Mettur Chemical and Industrial Corporation to protection were investigated by the Indian Tariff Board in 1946. The decision of the Government of India on the board's recommendations was to grant a subsidy.

The estimated annual consumption of soda ash amounts to 112,000 tons, mainly in the paper, textile, glass and silicate industries. The three producing units could account between them for 56,000 tons a year, but production has been running far below capacity and in 1948 amounted to 28,200 tons. Imports during the same period are believed to have been about 90,000 tons and at the time of writing the market is in a state of glut.

Protected Chemical Production

The Tariff Board considered in the post-war years the claims to protection of a number of producers of chemicals, with the following results. (Statistics of consumption and production have been taken from Tariff Board reports):—

Chemicals	Annual consumption in undivided India	Domestic production	Govt. of India decision on protection
	tons	tons	
Calcium chloride	850–1500	800–1000	Protection for the one applicant granted.
Sodium thiosulphate ...	600–800	1120 (capacity)	Granted
Sodium sulphite and sodium bisulphite . .	630–750	690 (capacity)	
Phosphoric acid	30–40	100	Granted. One applicant.
Sodium phosphate ...	200–300	150 phosphates	Granted. One applicant.
Acid calcium phosphate .	No separate statistics available		Rejected
Bichromates...	2400	3000–4000	Granted
Sodium sulphide ...	2000–3000	4800 (capacity)	Rejected
Sodium and potassium metabisulphites .	15–20	Small	Rejected
Stearic acid .	700–1000	760 (capacity)	Granted
Oleic acid ..	400–500	720 (capacity)	

Other chemicals produced in India are hydrochloric acid, potassium chlorate, alums, acetic acid, chlorosulphonic acid, potassium nitrate.

Details of the most important imported chemicals are given in the following table :

	1947–48 (undivided India)		6 months ending Sept., 1948 (Indian Union)		Leading sources of supply
Commodity	'000 cwts.	Rs. Lakhs.	'000 cwts.	Rs. Lakhs.	
Acetic acid...	39.8	32.3	4.2	3.9	U.S.A.
Tartaric ...	2.3	4.9	.9	1.4	Spain, Italy
Arsenic and oxides ...	16.4	8.6	1.1	.6	Portugal, Burma
Calcium carbide ...	85.7	18.9	38.3	9.3	Norway, Canada
Copper sulphate ...	26.2	6.3	5.3	2.2	U.K.
Sodium bicarbonate	104.7	14.1	103.0	16.7	U.K.
Borax ...	181.8	40.5	14.5	3.3	U.S.A.
Sodium carbonate ...	1,359.0	132.9	1,476.3	259.0	U.S.A., U.K.
Sodium hydrosulphite	62.2	61.3	23.7	19	U.K., U.S.A.

Any attempts to base estimates of demand on consumption of chemical fertilisers would be misleading. The soil of India has been for generations consistently undernourished. Indian consumption of nitrogenous fertiliser has always been far lower than the minimum required for reasonably productive use of the cultivated areas. In 1938-39 domestic production (of approximately 23,000 tons) of sulphate of ammonia was supplemented by imports of 76,700 tons. At the present time about 20,000 tons is produced annually as a by-product from the coking of coal.

Sulphate of Ammonia

In 1944 a technical mission from the U.K. provided by I.C.I. and the British Chemical Plant Manufacturers' Association, carried out an investigation and reported to the Government of India regarding the problems involved in the manufacture of sulphate of ammonia in British India in quantities up to 350,000 tons per annum. As a result it was decided to erect at Sindri in Bihar a single factory to produce the quantity stated, and to entrust the work to a U.S. firm of consultants working in collaboration with a U.K. chemical plant manufacturer. The factory is in course of erection.

Three major problems remain to be solved, however, before planned production can be carried out; first. supply of raw material (the gypsum deposits recommended for exploitation by the technical mission are, as stated above, now in Pakistan). Next, the provision of transport for supply of raw material and distribution of 1000 tons a day of finished products. Lastly, the provision of managerial and technical staff for the factory.

The technical mission considered the possibility of the use of ammonium nitrate, but took the view that in conditions of storage, transport and application likely to be found in India, sulphate was preferable. A factory in Travancore recently commenced production and hopes to achieve 45,000 tons a year. A factory in Mysore produces 5-6000 tons a year.

Imported Nitrogen

The table below shows the allocation of nitrogen to India from external sources during 1948-49 and, where available, the types and quantities of chemical fertilisers in which form it will be delivered.

(Fertilisers are imported on Government account from different sources according to the allocations made by the World Food Council. The quota allocated from the U.K. is purchased through the Indian Stores Department, London.)

Source	Quantity of nitrogen Metric tons	Types and quantities of fertilisers
Total—all sources	28,345	
of which from :		
U.K.	7,940	37,212 long tons sulphate of ammonia.
U.S.A. ...	4,000	19,213 long tons sulphate of ammonia.
Chile	3,960	25,144 long tons sodium nitrate.
Belgium ...	5,273	5,500 tons nitrate of soda. 19,500 tons ammonium sulphate. 2,000 tons di-ammonium phosphate.
Canada ...	4,172	8,520 tons ammonium nitrate 4,450 tons ammonium sulphate. 8,000 tons ammonium phosphate.
Italy	3,000	14,500 tons sulphate of ammonia.

In addition, India has secured from the U.S.S.R. a quantity of ammonium sulphate outside IEFC allocations, which will amount at least to 18,000 tons and may amount to over 60,000 tons.

The present consumption of phosphates in India is of the order of 30,000 tons annually. This is made up of superphosphates manufactured from imported rock phosphate and bone superphosphates made by treating crushed bones with sulphuric acid. This latter method, long regarded in advanced industrial countries as outmoded, is beginning to lose favour in India, where factories are turning over gradually from the production of superphosphate from bones to rock phosphate. Bone superphosphate is not ordinarily imported; local production is estimated at 5000 to 10,000 tons annually.

Superphosphate Plant Capacity

The installed plant capacity, actual and planned, for superphosphate manufacture is as follows:—

	Thousand tons
Present annual capacity	60
Plant under erection	10
Two plants already licensed	20
Plant for which capital issue already sanctioned	10
	100

Actual production was, however, in the summer of 1948 running at the rate of 10,000 tons a year only, due: to the high price of bones; cost of production of sulphuric acid; lack of adequate supplies of rock phosphate. Such superphosphate as is imported in small quantities each year is allocated to sugar mills only for sugar juice clarification, as there is a religious prejudice against the use of bone superphosphate for this purpose.

Although potash is potentially recoverable from Indian saline earths no systematic large-scale exploitation takes place, although about 15,000 tons of potassium nitrate are believed to be produced from such sources annually. Prior to 1939, undivided India consumed probably about 3500 tons of potassic fertilisers.

Drug Industry

As regards drugs, pharmaceuticals and fine chemicals, although some development took place in the industry during the war it remains on a comparatively small scale. Synthetic drugs produced in India are mostly made out of imported materials. In proprietary and patent medicines, the U.K. and U.S.A. are outstandingly the largest suppliers. In the fine chemicals field, there has been strong competition from the U.S.A., Switzerland and Holland. Good demand exists for laboratory and research chemicals although delivery has been slow owing to the difficulty of obtaining deck space. (These goods have to travel as deck cargo by law.)

Continued Protection for Indian Aluminium Industry

INDIA's Parliament at New Delhi has decided to continue for three years the protection granted to the country's aluminium industry in accordance with the Tariff Board's recommendations. The board had recommended protection on the principle of enhancement of import duty (30 per cent *ad valorem*) and the payment of a bounty to promote development of the industry and prevent price rises.

Giving comparative figures of the prices of non-ferrous metals, Mr. Neogy claimed that the price of aluminium had come down from Rs.84 in 1939 to Rs.75 per cwt. Devaluation had afforded some aid to the industry because the main competition came from Canada whose products would now cost about 28 per cent more.

It has been estimated that, on the present basis of consumption of 12,000 tons in India, the production leaves a gap of 9000 tons to be supplied by imports. Growing industrialisation of the country will produce an enlarged demand and increased production is essential.

Added to the 30 per cent protective duty, the consumer pays a " specific " duty of Rs.121 per ton of imported aluminium and the Indian industry is to be subsidised for the next three years to the extent of the difference between the fair selling price of the products, having regard to the respective costs of production, and the fair selling price of similar imported articles.

It is estimated that the consumer pays in all over 60 per cent more than the cost of aluminium, to keep the Indian industry going. The pioneers of the industry in India are two companies, one entirely Indian, and the other jointly owned by Indians, Canadians and the British, the Indian share being one-third.

The combined production of the two companies during 1948 was 3362 tons.

Indian Steel

The Indian Government has granted the Steel Corporation of Bengal a loan of Rs.50 million, to be spread over three years, towards financing its expansion programme. Present production of the corporation is 250,000 tons annually and is expected to increase by about 200,000 tons when additional plant has been installed.

The Chemist's Bookshelf

Modern Synthetic Rubbers. H. Barron. London: Chapman & Hall, Ltd. Third edition, revised and enlarged. 1949. Pp. xix + 636. 45s.

Most people with interests in the manufacture, properties, uses, and examination of synthetic rubbers will be familiar with the previous editions of this work, which first appeared in 1942. The new edition, while preserving the format of these, has been nearly doubled in size, and a considerable amount of information, especially from German sources, not available during wartime, has been included, together with developments in the U.S.A. and elsewhere, up to the middle of 1948. The large-scale production of synthetic rubbers is considered by the author to be the outstanding technical achievement of the war period—after atomic fission.

The first part of the book is devoted to the history, economics, and terminology of the industry. Production figures and costs, mainly in the U.S.A., of intermediate materials and synthetic rubbers are given and discussed, and numerous detailed tables show how the costs are actually derived. Descriptions of the chemical principles of polymerisation, copolymerisation, and emulsion polymerisation follow. The treatment is semi-popular.

A special chapter on the compounding of synthetic rubbers is included in this edition. The uses of added materials, fillers, accelerators, etc., and their effects on the properties of both natural and synthetic rubbers are reviewed, and tabulated data supplement the text.

The various kinds of synthetic rubbers are considered individually at great length under the categories: elastomers, based on butadiene; elastenes, based on olefines; thioplasts, based on polysulphides; ethenoid elastics, based on the polyvinyl grouping; and elastoplasts, cellulose ethers.

The greatest value of the book is probably in the detailed descriptions of methods of treatment and of the distinctive properties and advantages or disadvantages of the various kinds of synthetic rubbers in comparison with those of natural rubber.

For the analytical chemist, the final chapter, which covers qualitative and quantitative examination and testing, will be extremely useful.

Fundamentals of Synthetic Polymer Technology. R. Houwink. 1949. New York: Elsevier Publishing Company, Inc. London: Cleaver Hulme Press, Ltd. Pp. xii + 258. 25s.

This is No. 9 of Elsevier's polymer series on the chemistry, physics and technology of high polymeric and allied substances, and is outstanding among the abundant literature on plastics. It touches the fundamental background of the chemical and physical factors in the preparation and uses of these substances; suggests solutions to some of the many manufacturing problems. It presents also a discussion of the properties and of the structure of all the chief groups of industrial plastics. The latter is uncommon. An endeavour is made to give the views and methods prevailing in the three chief centres of polymer research—North America, Great Britain and Europe, and the further outlook in research work and application.

The book is divided into 16 chapters, beginning with the chemistry of polymers and their classification. Bonds inside and outside the molecules, physics and colloid chemistry, properties and standardisation, testing and processing of polymers, etc., are covered in four chapters. A section is devoted to the various derivatives based on ethylene, phenole, aniline, the carbamides, carboxylic acids, the cellulose, proteins and natural rubber. Synthetic rubbers, silicones and miscellaneous polymers are surveyed in separate chapters.

The book concludes with economic aspects of the so-called "plastics age," or rather "plastics and elastics age." There are 67 instructive tables, 195 illustrations and numerous well selected references. The book claims a place in every chemical library, and should be of value to everyone connected with the plastics industry.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LONDON VARNISH & ENAMEL CO., LTD. (M., 31/12/49.) November 28, letter of hypothecation securing Rs.500,000, to Mercantile Bank of India, Ltd.; charged on all stocks of varnishes, paints, enamels, etc., stored or to be stored in India. *Nil. June 14, 1949.

Satisfactions

BRITISH CELANESE, LTD., London, W. (M.S., 31/12/49.) Satisfaction December 2, of second debenture stock registered September 24. 1946, to the extent of £11,412.

BRITISH DIESEL OIL & PETROL CO., LTD. (formerly L. T. C. DISTILLATES, LTD.), London, S.W. (M.S., 31/12/49.) Satisfaction November 30, of debenture registered April 4, 1938, to the extent of £6000.

LONDON VARNISH & ENAMEL CO., LTD. (M.S., 31/12/49.) Satisfaction November 28, of letter of hypothecation registered October 15, 1949.

Company News

Bowmans Chemicals, Ltd.

Profits for the year, after providing for taxation amounted to £6967 and a balance of £4639 was brought forward from 1948. The directors recommend a final dividend of 7½ per cent (less tax) on the ordinary shares, making a total of 10 per cent for the year ended October 31.

Brown Bayley's Steel Works, Ltd.

Net profits for the past year were £233,571 (£271,029). £99,356 was spent on buildings and plant extensions and £200,000 transferred to fixed assets replacement reserve.

South Durham Steel & Iron Co., Ltd.

A record profit of £1,361,785 for the year was shown. Dividends paid on preference and ordinary shares were equivalent to 3 per cent of that total. £761,000 was set aside for depreciation and future development.

Increase of Capital

The following increase in registered capital has been announced: HOWARD & SONS, LTD., from £250,000 to £1,250,000.

New Registrations

Martin Rubeck, Ltd

Private company. (476,101.) Capital: £20,000. Manufacturers of detergents, soaps, cleansers, etc. Directors: M. J. H. Rubeck and I. J. Rubeck. Reg. office: 2 Clements Inn, Strand, W.C.2.

Harley Products, Ltd.

Private Company. (476,153.) Capital: £1000. Manufacturers of degreasers of all kinds, cleaning substances, lubricants, oils, etc. Secretary: B. Wilson. Reg. office: 174-6 Upper Brook Street, Manchester, 13.

The FBI Register

THE most comprehensive FBI Register yet produced will be released in January next by the Federation of British Industries. This directory is building a reputation as an authoritative guide to most of the principal British sources of supply. The 1949-50 Register, published jointly by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., will catalogue nearly 6000 firms under 5000 cross-reference headings. Sections include Addresses, giving complete information on all FBI members, Brands and Trademarks, and a Products and Services section which has strong interest for overseas buyers.

Reduced Nickel Consumption

World consumption of Canadian nickel in 1949 is estimated to be about 15 per cent lower than in 1948, which was a record year, according to the International Nickel Company of Canada. This decrease was partly due to the American steel and coal strikes. The U.S.A. takes some 65 per cent, and the United Kingdom 20 per cent of Canada's nickel output. Extensive plant alterations to improve production methods and utilise lower-grade ores are proceeding.

Chemical and Allied Stocks and Shares

STOCK markets are closing the year firmly, helped by a rally in British Funds, following the success of the Agricultural Mortgage £3 million issue of 3½ per cent debentures, which commanded a premium up to 6s. 3d. in initial dealings. Industrial shares have been firm, although year-end influences kept business in check. Moreover, sentiment was affected to some extent by the statement by the FBI emphasising the need under existing conditions of continuing the policy of restraint in dividend payments.

The prevailing view is that the near-term outlook for markets will be governed in the main by the trend in British Funds. This in turn will probably depend on whether there is evidence that the Government broker will still be prepared to support gilt-edged should prices show signs of any sharp reaction.

In common with most industrials, chemical and allied shares are ending the year well below highest prices, but generally well above lowest levels recorded during 1949. Share values, in fact, showed a down trend for the greater part of the year. This culminated in sharp declines during November, when British Funds fell heavily, later rallying well when official support for gilt-edged was provided by the Government broker and Sir Stafford Cripps announced his intention to "squeeze the bears."

The coming year, with the General Election looming ahead, is bound to be one of vital decisions whether there is to be more nationalisation or abolition of restrictions on private enterprise and initiative. The prevailing market view is that as the election approaches there may well be a good upward trend in industrial shares on the possibility of a change of Government, unless in the meantime there is another dollar crisis. The latter, it is feared in the City, may develop over the next few months unless there is marked expansion in the export drive to the U.S. and Canada.

Imperial Chemical are changing hands around 43s., which compares with highest and lowest prices of 49s. 4½d. and 40s. 4½d. recorded during 1949. Monsanto 5s. ordinary have been up to 63s. 6d. and down to 48s. in the past twelve months, and are now 50s. 3d. Extreme levels recorded during the year by Fisons have been 61s. and 26s. 3d. comparing with the current level of 27s. 3d.; for Laporte Chemicals, 5s. units have been 11s. and 9s. and the current price 9s. 6d. Albright & Wilson (extremes 31s. 9d. and 27s. 3d.) are now 30s., while in 1949 Brotherton 10s. shares have been up to 21s. and are now 19s. 1½d.

F. W. Berk 2s. 6d. shares are 12s. 9d., comparing with highest and lowest of 15s. and 12s. 6d. during the year. Shares of companies connected with plastics have fallen heavily in some cases, notably British Xylonite, which have been up to 126s. 3d. and down to 51s. 3d. compared with the current level of 60s. De la Rue's extremes were 41s. 6d. and 19s. 6d.; the current level is 22s. 9d. British Industrial Plastics 2s. shares have had 1949 extremes of 7s. 3d. and 3s. 10½d., and are now 4s. 9d.

Among other shares, highest and lowest and current prices are: Boots Drug (57s. 6d. and 45s. 6d.) and 50s. 3d.; Glaxo Laboratories (£24¾ and £16⅝) and £24¼; Tube Investments (£6 13/16 and £5 5/16) and £5 29/32; Lever & Unilever (49s. 6d. and 41s.) and 44s. 6d.; Borax Consolidated (64s. 3d. and 49s. 4½d.) and 58s. 3d. Turner & Newall have been up to 87s. and down to 69s., comparing with the current level of 74s. 9d. Ultramar showed the biggest fall in oils, extremes having been 38s. 1½d. and 6s. 9d.; the current price is 7s. Anglo-Iranian (extremes £9 7/32 and £6 25/32) are now £6⅞. Shell have been up to 78s. 1½d. and down to 57s. 6d. and are currently 66s. 10½d.

Export Licences Not Required

A FURTHER list of goods for which export licences are no longer required came into effect on Thursday, December 22, and included the following items:—Soaps of all kinds (other than ammonium soaps, ethanolamine soaps, metallic resinates, and scourers containing less than 6 per cent by weight of anhydrous soaps); arsenious oxide; mixtures of, or containing, potassium hydroxide and lithium hydroxide; potassium bicarbonate; potassium carbonate; potassium hydroxide (caustic potash); amino-salicylic acid. Licences will be required for naphthenic acid.

Relaxation of Import Restrictions

The Board of Trade announces the following correction to the latest relaxations of import licensing restrictions (THE CHEMICAL AGE, *61*, 868). Countries to which the relaxations do not apply should include: the Dominican Republic, Ecuador, El Salvador, Guatamala, Haiti.

Prices of British Chemical Products

Steady Demand Largely Met by Supplies

WITH the shorter week due to the Christmas holidays, most sections of the chemicals market have been dull, interest being mainly centred on the new contract rates. While a number of price alterations are confidently expected, a few only have been notified by manufacturers. These include hyposulphite of soda and sodium bisulphite, which have been increased by 22s. 6d. and 25s. per ton respectively. Ammonium chloride, grey galvanising and the fine white crystals, has been increased by 5s. per ton. Higher rates for soda ash are expected but details are not yet available. There is a fair amount of export inquiry, most of which is expected to find its way to the order books.

MANCHESTER.—Business has been virtually at a standstill throughout the greater part of the week, the textile and other chemical using establishments having been closed for relatively long holiday periods. A return to normal trading is not generally anticipated until after the turn of the year. Both in the home section and on the export side there is confidence that the demand for most heavy and light chemicals will then be actively resumed.

Price Changes

Rises: Ammonium chloride, salammoniac. sodium bisulphite, sodium hyposulphite, sulphur.

Reductions: Borax, boric acid.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride.—Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £55; in 1-cwt. bags, commercial, granular, £35 10s.; crystal, £38; powder, £39; extra fine powder, £40; B.P., granular, £45; crystal, £47-£48; powder, £48-£48 10s.; extra fine powder, £49-£49 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £63; crystal, £70; powder, £67 10s.; extra fine powder, £69 10s.; B.P., granular, £76 10s.-£79 15s.; crystal, £82; powder, £79 10s.-£81 15s.; extra fine powder, £81 10s.-£83 15s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 9½d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £119 10s., orange lead, £131 10s. Ground in oil: red, £140 10s., orange, £152 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £127 15s. per ton, Ground in oil, English, under two tons, £146 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£119 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £84 15s.; green seal, £83 15s.; red seal, £82 5s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December, £10 5s., rising by 1s. 6d. per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 18s. 6d., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. Manchester: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. Manchester: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. Manchester: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. Manchester: £5 10s. f.o.r.

Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. Manchester: 19s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. Manchester: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

London: December 22. The price of all unrefined and refined oils and fats is subject to possible revision as from January 1.

Taxation Reliefs for Industry

Easing the Burdens of Chemical Production and Research

RECENT modifications of income tax assessment procedure, in its applications to patents, plant maintenance, industrial buildings, etc., offer some degree of assistance to research workers as well as chemical engineering and manufacturing concerns. Some of the more important changes have been brought about by the Finance Act, 1949, which alleviates certain conditions imposed by the 1945 Income Tax Act.

Expenses incurred in securing a patent or registering a design are allowable deductions, although capital outlay (expenditure in purchasing patent rights) is not now outside tax law, as deductions from the profits account are allowed, normally by instalments over a period of 17 years. The vendor's tax assessment is on the amount received, and this can be charged over a period of six years, if preferred. Income from patent rights is accepted as "earned income" and so obtains the "earned income" allowance

Charitable contributions are not ordinarily allowable as trading expenses, except where they are for the welfare of employees. Similarly, contributions to trade charities and to employers' organisations are only allowable if associated with that particular trade.

Contributions, even of a capital nature, made to universities, colleges and the like, in respect of technical education, are allowable deductions from profits for tax purposes.

In scientific research, certain items (*e.g.*, salaries or fees of workers, cost of materials, repairs, maintenance, etc.) are allowable as trading expenses. Furthermore, capital expenditure on pilot plants, laboratories, etc., is allowable, but the deductions operate yearly over a period of five years. Under the Finance Act, 1949, expenditure incurred from April 6, 1949, is to be deductible on 60 per cent for the first year and on 10 per cent for each of the remaining four years.

For depreciation of machinery and plant (which includes most fittings and fixtures) allowances for "wear and tear" operate by agreed yearly percentages according to the type of machinery, etc., plus an additional amount, roughly one-fourth of that allowed through the "agreed rates" procedure.

Introduced by the Income Tax Act, 1945, the "initial allowance," which applies where fresh machinery or plant is installed (new or second hand), has, under the Finance Act, 1949, been doubled, making it now 40 per cent of the capital expenditure. A balancing allowance also applies where fresh machinery is installed before the capital expenditure has been deducted by the other allowances.

An initial allowance also applies to industrial buildings, being 10 per cent for new buildings, plus an annual maintenance allowance of 2 per cent per annum, which applies to new buildings and those less than 50 years old.

Control of Freon Production

THE E. I. Du Pont de Nemours Company Inc., has filed an application with the Securities and Exchange Commission for permission to buy General Motors Corporation's interest (49 per cent) in Kinetic Chemicals, Inc., for $9.7 million. The chemical company was founded in 1930 by Du Pont and General Motors to manufacture the Freon fluorinated hydrocarbon refrigerants, widely used to-day in the electric refrigeration industry. Kinetic Chemicals has two plants in Deepwater, New Jersey, within the Du Pont manufacturing area, and the other in East Chicago, Illinois. The uses of Freon continue to increase and expansion of the present productive capacity is foreseen.

Another U.S. Synthetic Fibre

THE Union Carbide & Carbon Corporation, one of the leading U.S. chemical concerns, plans to take up the manufacture of synthetic fibres on a large scale. Its earlier contribution in the synthetic fibres field in 1937, Vinyon, did not have a success in world markets comparable with Du Pont de Nemours's Nylon. It is reported that Vinyon becomes soft at 150°F. The corporation has since developed another new synthetic fibre, Dynel, which does not soften when heated to water boiling point. The new synthetic fibre crimps like wool when heated. It is not inflammable and exhibits the other resistant characteristics of the synthetic filaments.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Coloration of polyamide fibres.—A. Butterworth, and P. F. Crosland. Feb. 10 1947. 632,083.

Liquid antiseptics.—E. B. Brown, M. H. Gorin, and H. A. Abramson. Feb. 20 1945. 632,084.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond, G. G. Durrant, and R. J. Wigginton. Jan. 8 1947. 632,191.

Production of hydrogen.—Anglo-Iranian Oil Co., Ltd., J. N. Haresnape, and S. Hesling. 632,192.

Catalytic cracking of petroleum hydrocarbons.—Anglo-Iranian Oil Co., Ltd., J. N. Haresnape, and F. W. B. Porter. Jan. 10 1947. 632,193.

Production of ammonium nitrate charges.—I.C.I., Ltd., W. R. Davis, and J. Buckingham. Feb. 7 1947. 632,201.

Process for refining light oil.—Koppers Co., Inc. Feb. 18 1946. 632,315.

Modification of glycerides.—Procter & Gamble Co., and W. P. Williams. Feb. 19 1947. 632,089.

Production of cellular materials from rubber, plastics and bituminous compositions.—Expanded Rubber Co., Ltd., A. K. Unsworth, A. G. Goodchild, and A. Cooper. Feb 26 1947. 632,208.

Process of producing a solid ethylene polymer and the product resulting therefrom.—Standard Oil Co. March 5 1946. 632,316.

Production of coatings on aluminium and its alloys.—American Chemical Paint Co. March 9 1946. 632,090

Catalytic processes.—I.C.I., Ltd., P. W. Reynolds, and J. G. M. Bremner. March 17 1947 632,219.

Surface-active compositions and method of producing same.—American Cyanamid Co. May 27 1946. 632,321.

Changing the composition of coke oven gas.—Koppers Co., Inc. Nov. 16 1946. 632,231.

Process for removing asphaltic or resinous material from mineral oil.—Universal Oil Products Co. April 27 1946. 632,328.

Separation of air.—British Oxygen Co., Ltd., P. M. Schuftan, and N. W. Roberts. May 14 1947. 632,329.

Manufacture of artificial filaments, fibres, threads and the like filamentary products.—I.C.I., Ltd., D. Traill, and J. E. L. Thomas. May 27 1947. 632,240.

Manufacture of ricinoleyl amines and the treatment of water to prevent foaming.—I.C.I., Ltd., May 31 1946. 632,242.

Azo dye compounds.—General Aniline & Film Corporation. Nov. 14 1945. 632,092.

6-Substituted thiouracil compounds and process of preparing the same.—Sterling Drug. Inc. July 30 1946. 632,094.

Amino-formaldehyde resin compositions incorporating latent curing agents.—British Industrial Plastics, Ltd. June 28 1946. 632,335.

Process of preventing or reducing corrosion by acidic steam condensate.—Anglo-Iranian Oil Co., Ltd. (K. B. Ross, L. A. Wilshere, and M. Benger). July 1 1947. 632,246.

Manufacture of monoazo-dyestuffs.—Ciba, Ltd. July 15 1946. 632,095.

Silicon carbide articles and methods of forming them. A. Abbey. (Carborundum Co.). July 4 1947. 632,247.

Azo dyestuffs of N-substituted anthranilic acids.—General Aniline & Film Corporation. July 19 1944. 632,096.

Manufacture of acyl derivatives of aceto-acetic acid amides.—Ciba, Ltd. July 30 1946. 632,341.

Methods of means for compounding gaseous mixtures.—British Oxygen Co., Ltd., and W. Edmondson. Aug. 1 1947. 632,343.

Method of recovering a stable liquid composition.—International Latex Processes. June 21 1944. 632,098.

Preparation of 1: 4-dihalobutanes.—E. I. Du Pont de Nemours & Co. Aug. 8 1946. 632,346.

Manufacture of phenyl acetamide.—Distillers Co., Ltd., J. Howlett, and G. W. Jackson. Aug. 25 1947. 632,101.

Refining of kerosene.—Anglo-Iranian Oil Co., Ltd. (K. B. Ross, and R. K. Spiers). Sept. 10 1947. 632,349.

Stabilised polythene compositions.—E. I. Du Pont de Nemours & Co. Sept. 25 1946. 632,270.

Preparation of derivatives of phenthiazine.—Soc. des Usines Chimiques Rhone-Poulenc. March 1 1947. 632,277.

Curing synthetic copolymers containing allylic unsaturation.—United States Rubber Co. March 13 1947. 632,108.

Plasticised vinylidene chloride copolymers of the organic solvent soluble type.—British Cellophane, Ltd. Dec. 21 1946. 632,114.

Apparatus for halogenation of aromatic hydrocarbons.—Lummus Co. June 22 1942. 632,213.

Method of preparing aqueous dispersions of an acid reacting synthetic resin.—Monsanto Chemical Co. Dec. 10 1942. 632,024.

Dehydrogenation catalysts and method of preparing same.—Koppers Co., Inc. Dec. 31 1943. 632,350.

Manufacture of titanium in a cold-malleable form.—W. Kroll. July 11 1938. 632,564.

Manufacture and use of halogen-containing insecticidal organic compounds and the treatment of materials therewith.—Geigy Co., Ltd., and I. E. Balaban. July 28 1944. 632,635.

Apparatus and method for conditioning gases.—Delaware Engineering Corporation. Oct. 20 1945. 632,643.

Manufacture of steel.—Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. Jan 24 1940. 632,428.

Separation of solid particles from air or other gases.—E. V. Giles. April 11 1946. 632,360.

Apparatus for washing gases.—H. Rathgeb. Aug. 27 1945. 632,654.

Fertilisers.—I.C.I., Ltd., J. W. R. Rayner, and J. H. Hudson. Aug. 27 1947. 632,577.

Process for the production of producer gas from carbonaceous material. — C. Arnold. (Standard Oil Development Co.). Sept. 11 1946. 632,505.

Evaporation of water from concentrated solutions of calcium nitrate.—Directie Van De Staatsmijnen in Limburg. Nov. 17 1941. 632,580.

Process for the preparation of vinylpyridines.—E. I. Du Pont de Nemours & Co., and L. F. Salisbury. Oct. 2 1946. 632,661.

Methods of separating mixed fatty acids. —Emery Industries Inc. July 29 1940. 632,583.

Moulding of organic plastic materials.—Dow Chemical Co. Feb. 7 1946. 632,586.

Separation of gaseous mixtures at low temperatures.—Petrocarbon, Ltd., and A. A. Aicher. Feb. 19 1947. 632,438.

Preparation of 2-amino-3-carboxymethylmercapto-propanoic acid.—Merck & Co. Inc. March 14 1946. 632,682.

Production of insecticides and synergists. —H. G. C. Fairweather. (U.S. Industrial Chemicals, Inc.). Feb. 25 1947. 632,589.

Hydantoin and method for obtaining the same.—Parke, Davis & Co. March 11 1946. 632,683.

Filters for gaseous mediums.—H. Astbury. April 5 1947. 632,385.

Apparatus for welding thermoplastic films.—Dunlop Rubber Co., Ltd., A. H. M. Hytch, and S. W. Gough. April 10 1947. 632,690.

Recovery of ammonia from gases containing it and the recovery of iron from waste pickle liquor.—Semet-Solvay Co. May 28 1946. 632,518.

Production of fuel gas.—Standard Oil Development Co. Oct. 18 1946. 632,386.

Method of treating tall oil in order to separate therefrom a fatty acid fraction as distillate. - Distillation Products, Inc. Nov. 9 1946. 632,698.

Process for the preparation of azo-dyestuffs on the fibre.—Soc. Anon. de Matières Colorantes et Produits Chimiques Francolor. May 14 1946. 632,595.

Manufacture of monoazo-dyestuffs.—Ciba, Ltd. May 31 1946. 632,699.

Processing of synthetic rubbers.—British Thomson-Houston Co., Ltd. May 29 1946. 632,390.

Method of coating with quartz by thermal evaporation.—R. C. Noyes. (Libbey-Owens-Ford Glass Co.). June 12 1947. 632,442.

Alkylation of paraffin hydrocarbons.—Universal Oil Products Co. Dec. 31 1938. 632,525.

Method of and apparatus for de-gassing lubricating grease.—N.V. De Bataafsche Petroleum Maatschappij. May 24 1940. 632,527.

Corrosion inhibition.—I.C.I., Ltd. July 22 1946. 632,533.

Process for the production of activated adsorbing products containing silicic acid. —A. Christiansen. Aug. 17 1946. 632,535.

Production of neutral phthalates.—Shell Refining & Marketing Co., Ltd., P. J. Garner, and G. Watson. Oct. 6 1947. 632,447.

Benzoic acid esters.—Sharp & Dohme, Inc. Oct. 5 1943. 632,561.

Process for the manufacture of organo-silicon compounds.—Dow Corning Corporation, and J. T. Goodwin, Jun. July 1 1947. 632,563.

Evaporation of water from concentrated solutions of calcium nitrate.—Directie Van De Staatsmijnen in Limburg. Feb. 19 1945. 632,633.

Manufacture of N-alkyl or N-aralkyl derivatives of oxyazolidine-2: 4-diones.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. July 20 1948. 632,423.

Impregnated fibrous glass products.—Pittsburg Plate Glass Co. Dec. 1 1941. 632,983.

Fire-retardant and potentially heat-insulating compositions.—Albi Chemical Corporation. June 20 1944. 632,844.

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